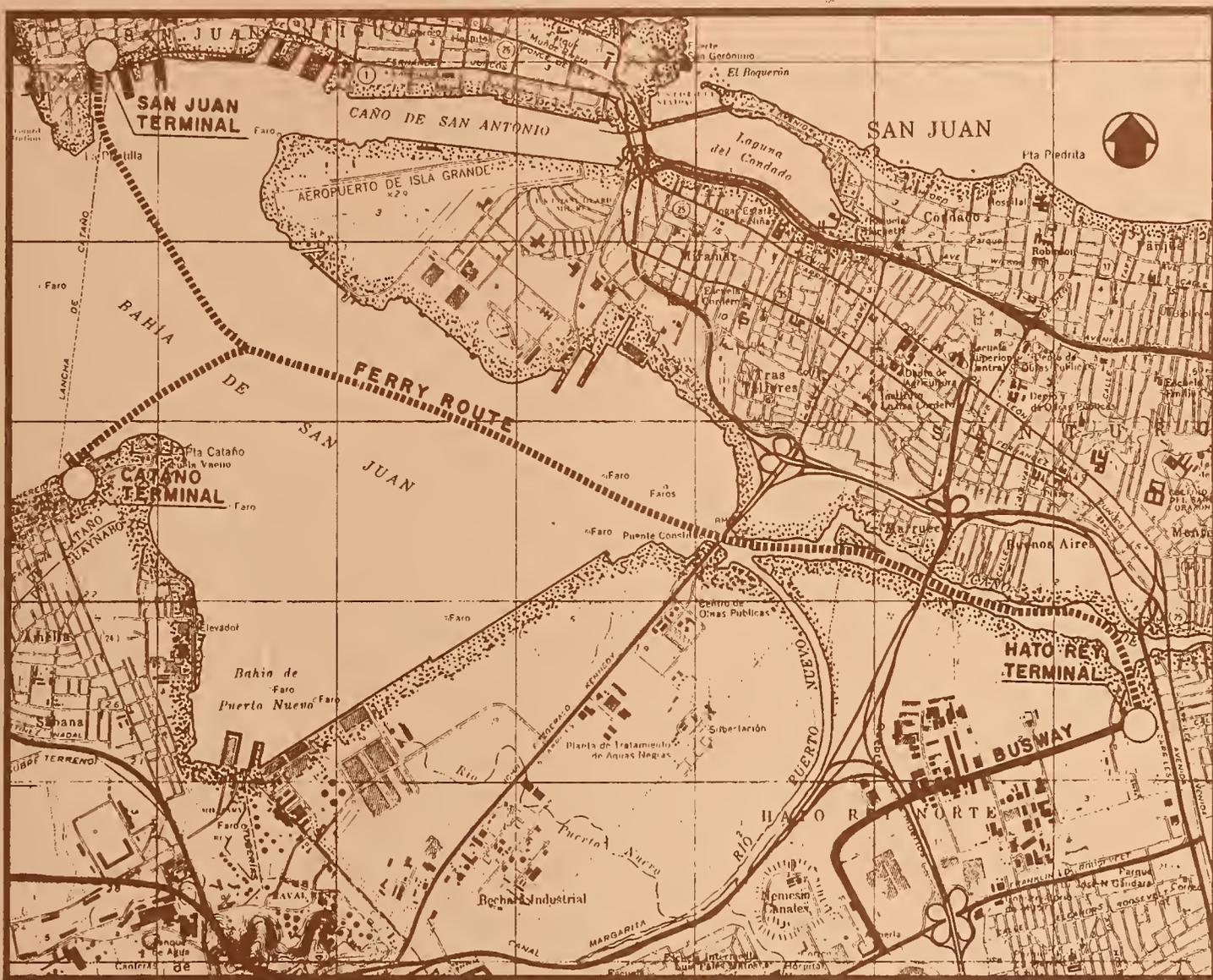


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FINAL
ENVIRONMENTAL IMPACT STATEMENT

SAN JUAN URBAN CORE TRANSIT SYSTEM



U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS

AUGUST 1983



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U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

Headquarters

400 Seventh St., S.W.
Washington, D.C. 20590

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FINAL ENVIRONMENTAL IMPACT
STATEMENT AND WETLAND FINDING

SAN JUAN URBAN CORE
TRANSIT SYSTEM
(AGUA - GUAGUA)

SAN JUAN, PUERTO RICO

August 1, 1983
Date



Charles H. Graves
Director, Office of
Planning Assistance

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

FINAL ENVIRONMENTAL IMPACT STATEMENT AND WETLAND FINDING

LEAD AGENCY

Urban Mass Transportation Administration

COOPERATING AGENCY

Puerto Rico Department of Transportation and Public Works

TITLE OF PROPOSED ACTION

San Juan Urban Core Transit System

ABSTRACT

The Puerto Rico Department of Transportation and Public Works is proposing the construction of a transportation system in the San Juan Metropolitan Area that will use water and land transportation modes. The proposed project will connect, by means of a waterway, Old San Juan and Catano with the New Center of San Juan in Hato Rey. Almost 2 miles of the Martin Pena Channel will be dredged and upgraded to improve its navigability. A 180' wide channel between bulkheads is preferred over the other five waterway alternatives considered. Improvements to the existing terminal facilities at Old San Juan and Catano are contemplated. The construction of a new multimodal terminal facility in Hato Rey is part of the proposed project. To serve the new terminal from land, four different alternatives for busways were considered in order to connect it with Plaza Las Americas Shopping Center and Bithorn/Clemente Sport Complex. The busway along the metro right-of-way is preferred. This document discusses and analyses the impact of each alternative as well as the No-Build alternative.

For further information, please contact:

Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 7th Street, S.W.
Washington, D.C. 20590
(202) 426-2360

Nestor Quevedo, P.E.
Chief, Environmental Studies
Division
Puerto Rico Department of
Transportation & Public Works
P.O. Box 41269, Minillas Station
Santurce, Puerto Rico 00940
(809) 726-3336

The Final EIS was made available on August 12, 1983

SUMMARY

A. DESCRIPTION OF THE PROPOSED ACTION

The proposed project consists of providing a multimodal transportation system to serve the new Urban Center of Metropolitan San Juan. The system will consist of ferry and bus services to a new intermodal passenger terminal to be located near the intersection of the Martin Pena Channel and Munoz Rivera Avenue in Hato Rey. The terminal will be designated as the public transportation center in Hato Rey and will provide convenient transfers between ferries, buses, publicos (jitneys) and taxis. Right-of-way through the terminal will be preserved for possible future rapid transit construction.

The present ferry service between Old San Juan and Catano will be upgraded and extended through the western section of the Martin Pena Channel to the new terminal. New ferries will be constructed and the channel will be dredged to enable their passage from the San Juan Bay to the new terminal. Existing ferry terminals and maintenance facilities will be improved and updated.

New bus service will connect the terminal to Plaza Las Americas and to existing parking facilities at the Bithorn/Clemente Sport Complex, through the New Center of San Juan.

B. NO BUILD

This alternative consists of continuing the existing bus transit service within Hato Rey and from Hato Rey to Old San Juan. Bus service from Hato Rey to Old San Juan currently uses contra flow bus lanes and averages 10-11 mph, making the trip in about 30 minutes with 12-15 minutes headways. Existing bus service within New Center is limited and subject to traffic delays and does not serve the newly developing areas.

Build Alternatives

The build alternatives would transport transit passengers between Hato Rey and Old San Juan in about 15 minutes by a new ferry service. In addition, transit service within the New Center area would be improved by providing faster service and by extending bus routes closer to the new development.

The proposed project can be divided into four separate tasks for engineering and construction purposes: 1) water-way, 2) vessels, 3) terminals, and 4) busway. Several alternatives were considered during the DEIS stage for each of these tasks. No important differences in environmental impacts are expected for vessel and terminal alternatives.

Six channel design alternatives are under consideration. The level of service, cost and environmental consequences varies for each alternative. Two waterway width alternatives were considered: 100' (one way) and 180' (two way). Within these two alternatives, variations were introduced in order to consider bulkheads and revetted dike systems in an effort to minimize the mangrove and mudflat areas taken and to minimize the protection of side slopes and remaining mangroves against wake action. Alternative 5 (180' wide with bulkheads) is preferred by the local authorities.

Four busway alternatives were considered. The length, cost, level of service and socio-economic and environmental impacts vary with each alternative. While alternatives 1 and 2 run on exclusive bus lanes for part of the route, alternatives 3 and 4 run in mixed traffic throughout. Alternative 1 (Bus lanes on the metro right-of-way) is preferred.

C. IMPACTS OF THE PREFERRED ALTERNATIVES

The following activities have been identified as potential causes of socio-economic and environmental impacts resulting from the locally preferred alternatives:

1. Relocation of the Barrio Tokio (490 households, 43 businesses, and 3 non-profit organizations) by the waterway and terminal.
2. Displacement of one (1) business in Hato Rey core area by the busway.
3. Acquisition of 6.18 acres of private land in the area of the New Center of San Juan by the busway.
4. Acquisition of 53 parking spaces at Plaza Las Americas Shopping Center.
5. Elimination of 6.36 acres of mangrove along the Martin Pena Channel.
6. Elimination of part of the mudflat area along the Martin Pena Channel.
7. Earthwork and other construction activities.

D. MITIGATION MEASURES

The following impact mitigation measures are under consideration:

1. Mangrove planting on 7 acres in the area of the Tres Monjitas Channel. Minimization of the mangrove and mudflat areas to be taken.
2. Protection of the remaining areas of mangroves and mudflats against the wake action and encouragement of natural growth of the mangroves up to the bulkheads.
3. Mudflat replacement.
4. Water monitoring during dredging activities in order to determine if turbidity control measures are necessary.
5. Measures for the control of erosion and sedimentation during construction.
6. Strict control measures to avoid any accidental spillage either during construction or operation in the channel.
7. Noise and airborne particulate control measures during the construction of the busway.
8. Relocation of Barrio Tokio will be performed in accordance with the Uniform Relocation Act.

E. PERMITS REQUIRED

1. Application for Approval for the Construction or Operation of Emission Sources in Puerto Rico - Environmental Quality Board.
2. Application for the Disposal of Solid Waste - Environmental Quality Board.
3. Application for the Extraction of Materials from the Earth Crust (Solicitud de Permiso Extraccion de Materiales de la Corteza Terrestre) - Department of Natural Resources.
4. Dredge and Fill Permit from the Corps of Engineers required by Section 404 of the Federal Water Pollution Control Act.
5. Ocean Dumping Permit from the Corps of Engineers required by Section 103 of Marine Protection and Sanctuaries Act.

RESUMEN

DESCRIPCION DE LA ACCION PROPUESTA

El proyecto propuesto provee un sistema combinado de transportación pública para el centro urbano del Area Metropolitana de San Juan. El sistema consistirá de servicios de lanchas y guaguas. Se proveerá un terminal de lanchas y guaguas cerca de la intersección del Caño Martín Peña y la Avenida Muñoz Rivera en Hato Rey, el cual servirá de enlace entre ambas fases. En este lugar, se reservará la servidumbre de paso para la posible construcción de un sistema de metro en el futuro.

El servicio de lanchas existente entre el Viejo San Juan y Cataño será mejorado y ampliado a través de la sección oeste del Caño Martín Peña hasta el nuevo terminal. Se proveerán lanchas nuevas y se dragará el caño para permitir el paso de las lanchas desde la Bahía de San Juan hasta el nuevo terminal. Los terminales existentes en Cataño y el Viejo San Juan serán mejorados y se proveerán facilidades de mantenimiento modernas y adecuadas.

El nuevo servicio de guaguas conectará el nuevo terminal con Plaza Las Américas y las facilidades de estacionamiento disponibles en el Parque Hiram Bithorn y el Coliseo Roberto Clemente, a través del Nuevo Centro de San Juan.

ALTERNATIVAS

1. No Construcción

Esta alternativa propone continuar con el servicio de guaguas existente en el área de Hato Rey y el Viejo San Juan. Las guaguas que actualmente dan servicio entre Hato Rey y el Viejo San Juan hacen uso de carriles exclusivos y viajan a una velocidad promedio de 10 a 11 m.p.h., para un tiempo total de recorrido de 30 minutos aproximadamente. El tiempo que transcurre entre la salida de una y otra guagua es de 12 a 15 minutos. El servicio de guaguas existente dentro del Nuevo Centro de San Juan es limitado y está sujeto a atrasos debido a la congestión vehicular. El mismo no da servicio a las áreas recientemente desarrolladas.

2. Alternativas de Construcción

El proyecto propuesto puede ser dividido en cuatro acciones distintas para los fines de ingeniería y construcción: 1) ruta de lanchas, 2) lanchas, 3) terminales, y 4) ruta de guaguas.

Se consideraron seis (6) alternativas para la sección transversal de la ruta de lanchas en el Caño Martín Peña. La calidad del servicio a prestarse, el costo y las consecuencias ambientales varían para cada alternativa. En términos de ancho del canal, se consideró cien pies (100') suficiente para operar en una sola dirección a la vez, y ciento ochenta pies (180'), suficiente para operar en ambas direcciones simultáneamente. Dentro de

estas dos alternativas, se introdujeron variaciones, en un esfuerzo por minimizar las áreas de mangle y lodazales a afectarse, a la vez que se provee la mayor protección posible de los taludes del canal y las áreas de mangles y lodazales a preservarse contra los efectos de oleaje a ser generado por las lanchas en movimiento. La alternativa preferida es la número 5, que contempla un canal de 180 pies de ancho.

Para la ruta de guaguas se consideraron cuatro (4) alternativas. El largo de ruta, costo, calidad del servicio e impactos socio-económicos y ambientales varían ligeramente para cada alternativa. Con las alternativas 1 y 2 las guaguas operarían en carriles exclusivos la mayor parte del tiempo; con las alternativas 3 y 4 las guaguas operarían en tránsito mixto todo el tiempo. La alternativa 1 es la preferida.

Igualmente, varias alternativas se encuentran bajo estudio para la localización del terminal en Hato Rey: al este, oeste y sur del Canal Ochoa. Las alternativas al este y al sur requerirán la adquisición de terrenos privados. La localización final del terminal dependerá del estudio que actualmente se realiza para las facilidades de terminales.

No se prevén diferencias de importancia en términos de impacto ambiental para las diferentes alternativas de lanchas y terminales.

3. Impactos

Las siguientes acciones requeridas por el proyecto han sido identificadas como posibles generadores de impactos socio-económicos y ambientales:

1. Relocalización del Barrio Tokio (490 casas, 43 negocios y 3 organizaciones sin fines pecuniarios) debido al proyecto de vía acuática.
2. Desplazamiento de una estructura comercial en el área de Hato Rey, que actualmente no está en uso.
3. Adquisición de 6.18 acres de terreno privado en el área del Nuevo Centro de San Juan.
4. Adquisición de 53 espacios de estacionamiento en Plaza Las Américas.
5. Eliminación de 6.36 acres de mangle a lo largo del Caño Martín Peña.
6. Eliminación de parte de las áreas de lodazales a lo largo del Caño Martín Peña.
7. Movimiento de tierra y otras actividades durante la construcción.

4. Medidas de Mitigación

Para la mitigación de los impactos a generarse por las acciones antes enumeradas, se tomarán las siguientes medidas:

1. El desplazamiento y realojo de familias, negocios y entidades se hará conforme la Ley de Realojo Uniforme.
2. Minimización de las áreas de mangles y lodazales a eliminarse. Se sembrarán 7 acres de mangles en el área del Canal Tres Monjitas.
3. Protección de las áreas de mangles y lodazales a preservarse contra el oleaje a ser generado por el paso de las lanchas y se fomentará el crecimiento natural del mangle hasta el mamparo (bulkhead).
4. Reemplazo de las áreas de lodazales a eliminarse.
5. Análisis del agua durante las actividades de dragado para determinar las medidas de control de turbiedad necesarias.
6. Medidas para el control de la erosión y sedimentación durante la construcción.
7. Medidas de control estrictas durante la construcción y operación del proyecto para evitar el derrame accidental de aceites y combustible en el caño.
8. Medidas de control de ruido y polvo fugitivo durante la construcción de la ruta de guaguas.

5. Permisos Necesarios

Agencias Federales

1. Permiso para el Dragado del Caño Martín Peña - Cuerpo de Ingenieros del Ejército de los Estados Unidos.
2. Permiso para la Disposición en el Mar de Material Dragado - Cuerpo de Ingenieros del Ejército de los Estados Unidos.

Agencias Estatales

1. Permiso para la Extracción de Material de la Corteza Terrestre - Departamento de Recursos Naturales.
2. Permiso para la Disposición de Desperdicios Sólidos - Junta de Calidad Ambiental.
3. Permiso para la Construcción u Operación de Fuentes de Emisión en Puerto Rico - Junta de Calidad Ambiental.

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CHAPTER I

NEED FOR AND PURPOSE OF PROPOSED ACTION

A. DESCRIPTION OF THE PROJECT AREA

The San Juan Metropolitan Area is by far the largest in Puerto Rico with 37% of the Island's population and 1,175,451 residents in 1980. The area has grown very rapidly as new centers have surpassed traditional activity centers.

Of very recent development is the area of Hato Rey which includes the "New Center of San Juan." Hato Rey is now the office center of San Juan and also contains the largest shopping center in Latin America (Plaza Las Americas). The area between the office and shopping centers is rapidly developing. In accordance with the plan for the New Center, varied land uses are in the process of occupying this area, including residential, recreational, institutional as well as commercial.

While the New Center of San Juan has surpassed the old center in size, Old San Juan has not diminished in importance. It still remains the primary tourist center and an important office, retail, residential and institutional center. Section III.B of this report contains a more detailed description of these areas.

As in all U.S. cities the automobile has become the dominant transportation mode. Even though the routes of the Metropolitan Bus Authority connect New Center with Old San Juan, auto trips far exceed bus trips. In spite of the provision of counter flow bus lanes and very congested highways, transit has not been able to compete with the automobile.

While highway facilities are congested, other possible transportation facilities are under utilized. A water route exists between old San Juan and the New Center using the San Juan Bay and the Martin Pena Channel, which is not used at all for passenger transportation. Current ferry service operates only across the bay from Old San Juan to Catano.

B. NEED FOR ACTION

The growth in auto traffic, the decline in transit usage and the growth and shift in development have created the traditional modern American transportation situation where autos and buses operate in extremely congested conditions. Because bus service deteriorates under these conditions, ridership decreases, and travel times and deficits will increase. In Old San Juan the narrow streets are extremely congested and available parking cannot meet demand. In New Center congestion is also a problem and there is shortage of parking.

Transit is limited by very slow speeds. On the counter flow bus lanes, buses average only 10-11 mph and while in mixed traffic they average only 7 mph. In addition, in New Center the bus service does not serve well the newly developing areas, thus encouraging even more auto use and congestion. Furthermore, the inefficiencies caused by traffic congestion have contributed to rapidly increasing deficits. The Metropolitan Bus Authority's deficit is \$18 million per year and rising rapidly. At the same time, the small ferry service from Catano to Old San Juan runs a deficit of \$2 million per year.

C. DESCRIPTION OF THE PROPOSED PROJECT

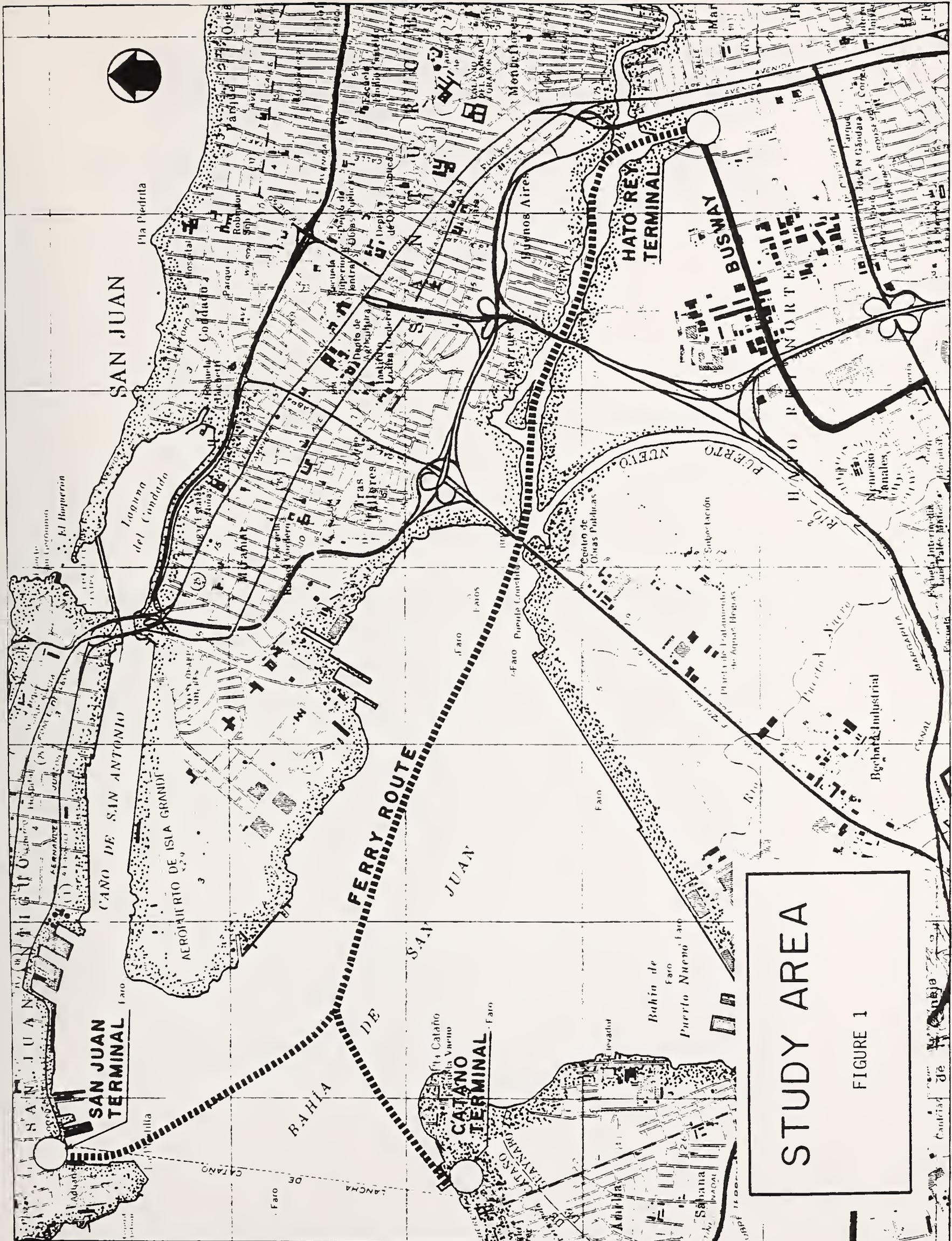
The proposed project consists of providing a multimodal transportation system to serve the new Urban Center of Metropolitan San Juan. The system will consist of ferry and bus services to a new intermodal passenger terminal to be located near the intersection of the Martin Pena Channel and Munoz Rivera Avenue in Hato Rey. The terminal will be designated as the public transportation hub of Nuevo Centro, the New Center of San Juan (NCSJ). This transportation point will provide convenient connections between ferries, buses, publico (jitneys) and taxis. Right-of-way through the terminal will be preserved for possible future rapid transit construction.

The present ferry service between Old San Juan and Catano will be upgraded and extended from Ochoa channel through the western section of the Martin Pena Channel to the new terminal. New ferries will be constructed and the channel will be dredged and widened in some areas to enable their passage from the San Juan Bay to the new terminal. Existing ferry terminals will be improved and updated maintenance facilities provided. Two additional ferry terminals at intermediate points along the channel are contemplated for future construction as needed in the event that planned developments alongside the channel are constructed. However, those intermediate terminals are not part of the present proposed action.

New bus service will connect the terminal to Plaza Las Americas and to existing parking facilities at the Bithorn/Clemente Sport Complex, through the New Center of San Juan. Existing routes of the Metropolitan Bus Authority (MBA) will be modified to connect the new terminal with other major activity center in Metropolitan San Juan.

Figure 1 shows the Proposed Routes

This proposal will replace the existing Catano Ferry with a new and expanded water service which will run between Catano, Old San Juan and the new intermodal terminal at New Center for San Juan. Because of the efficiencies available through improved equipment, rapid turn around times and a more efficient route structure, it would simultaneously be possible to reduce the overall existing



STUDY AREA

FIGURE 1

deficit of the ferry system and expand ferry ridership from the existing level of 6,500 passengers per day to an estimated 15,100 passengers. This increased transit ridership would also tend to reduce traffic congestion and parking demand in Old San Juan.

Table 1 shows the estimated daily patronage for the proposed transportation system at the estimated time of completion and in year 2000.

Table 1
Estimated Daily Patronage

<u>Section</u>	<u>1985</u>	<u>2000</u>
Hato-Rey - Old San Juan (ferry)	8,600	10,220
New Center of San Juan (bus lanes)	8,750	11,530
NCSJ - Plaza Las Americas (bus lanes)	10,450	14,000
Plaza Las Americas-Sports Complex (bus lanes)	3,750	5,060

The proposed bus lanes will not only provide excellent public transportation access to the ferry, but will also serve (along with the ferry) to unify the New Center area while serving as a catalyst for new growth in the area. The proposed bus lanes will permit, for the first time, fast, direct bus service between the office center of Hato Rey and the shopping center of Plaza Las Americas. In addition, the bus lanes will help ease auto and parking congestion in Hato Rey by providing direct, fast public transportation access between Hato Rey and the 8,000 parking spaces at the sports complex. Furthermore the bus lanes will serve the new development (including schools, offices and residences) which is currently occurring north of existing bus service in compliance with the plan for the development of the NCSJ. The bus lanes and the ferry terminal will tend to concentrate new development here and to increase the use of transit by the residents, workers and visitors in this area.

The project would also increase peak hour travel speeds in the urban core, by avoiding congested streets and possibly providing new bus guideways. It would also very substantially relieve congestion at key points and intersections where service is at level D or lower and where the traffic volume to capacity ratio approaches 1:1 during peak hours. Particularly congested are Roosevelt Avenue leading into the expressway at Plaza Las Americas shopping center, Ponce de Leon Avenue moving north, as well as other points planned for development within New Center where these levels and ratios would be experienced without an improved mass transit system.

Although the urban core is presently served by non local bus lines as part of the MBA system, they have not been able to solve the problem. Long headways, crowded conditions and low travel speeds have resulted in insignificant transit use for internal circulation.

The rapid growth in the Urban Core has also created pressure to develop the areas which have been reserved for future public transportation purposes. The right-of-way of both the north-south and east-west Metro Lines as well as the ferry dock on the Ochoa Channel could be preempted by private development in the near future unless positive action is taken soon to preserve them for transit use.

CHAPTER II

ALTERNATIVES

Several alternatives were examined in order to address the problem presented above. These include the no-build and several build alternatives. The build alternatives consist of five elements 1) the vessels, 2) the waterway, 3) the new terminal, 4) the existing terminals, and 5) the busway. Several alternatives were examined for the waterway (6), the new terminal location (3), and the busway (4). The vessels will be designed within given parameters and the impact of their operation is discussed in the context of the waterway alternatives. Minor changes in the existing terminals may be required in order to accommodate the new vessels. No significant impact from the changes in the existing terminals is anticipated.

A. NO-BUILD ALTERNATIVE

The No-build alternative would continue the existing public transportation system operated by the Metropolitan Bus Authority, within the New Center area and between this area and Old San Juan. Bus service from New Center to Old San Juan is offered in counter flow bus lanes along Ponce de Leon, and Munoz Rivera and Fernandez Juncos Avenues. Service scheduled to operate on 12/15 minute headway during the peak hours and take about 30 minutes between Old San Juan and the New Center. Delays and scheduling problems are frequent on this route. East-West Transit service within the New Center operates on Chardon Street and F.D. Roosevelt Avenue. This service operates in mixed traffic at low speeds and is subject to delays and problems with schedule adherence. No service is offered in the northern part of New Center to serve the new development.

Although this alternative consists of doing nothing some impacts would result. Design and construction expenses would not be incurred, saving the Federal and the Commonwealth of Puerto Rico Governments \$30 to \$60 million. No displacements would be necessary. Temporary environmentally adverse activities resulting from dredging the Martin Pena Channel and dumping dredge material in ocean or upland sites would not take place. Consequently, the ecology in the project area - mudflats, mangroves, avifauna, endangered species, food chains - would not be disturbed.

On the other hand, should this alternative be selected, the existing transportation choices between Hato Rey and Old San Juan would stay the same. People needing transportation between these two important activity centers districts would have to make use of the private automobile or any available transportation services. Consequently, they would continue to confront the increasing problems of traffic congestion, lack of parking in Old San Juan, and Hato Rey, high automobile operating costs, or long headways, crowded conditions and low travel speeds on the buses. By not providing the fast and direct ferry service between Hato Rey and Old San Juan and the local bus service in the area of the New Center of San Juan, the development and economic growth of such area would be hampered. The no action alternative also implies higher energy consumption (Section IV.F.).

B. BUILD ALTERNATIVES

The proposed project can be divided into four separate tasks for engineering and construction purposes: 1) waterway, 2) vessels, 3) terminals, and 4) busway. Several alternatives are being considered at this stage for each of these tasks. The locally preferred alternatives are presented at the end of this chapter.

The waterway and the vessel to be constructed are closely interrelated. As the selection of vessels governs the waterway design, the vessel general design parameters have been established already as follows:

Length	85 feet
Beam	30 feet
Draft	6 feet (static)
Wind Draft	Must clear bridges (lowest is 19.2 feet above mean sea level), say <u>±</u> 13 feet.
No. of passengers	200
Speed	Able to average at least 15 mph between San Juan and Munoz Rivera Terminal (c. 3 miles in the San Juan Bay and 2 miles in the Martin Pena-Ochoa waterway)
Wake	No greater than one foot in the Channel.
Hull form	consider catamaran; other forms that optimize speed/wake relationship
Power	Conventional diesel
Maneuverability	Highly maneuverable in tight channel and docking conditions
Turn around time	2-3 minutes with simple ramp loading/unloading system
Handicapped patrons	Facilities for handicapped individuals as required by applicable Federal and/or Commonwealth laws

The vessel finally selected should meet this design criteria and the controlling factor for such selection will be cost. No important environmental differences are expected for any vessel meeting these criteria.

1. Waterway

Safe navigable conditions in the Martin Pena Channel are necessary for the proposed vessels operation. Dredging is required to attain the depth necessary for such operation. Channel depths necessary to accommodate the design vessels have been determined after considering such factors as trim, squat, and maneuverability, in addition to the draft of the vessel. These factors result in a total required channel depth 4 feet greater than the static draft of the design vessel. The 4-foot depth underkeel includes one foot for trim, one foot for squat and 2 feet for maneuverability between the bottom of the vessel and the bottom of the channel. Two feet additional overdepth dredging would be permitted as creditable pay excavation to cover normal inaccuracies in the dredging process. Six channel section alternatives are under consideration. The level of service, cost and environmental consequences varies for each alternative.

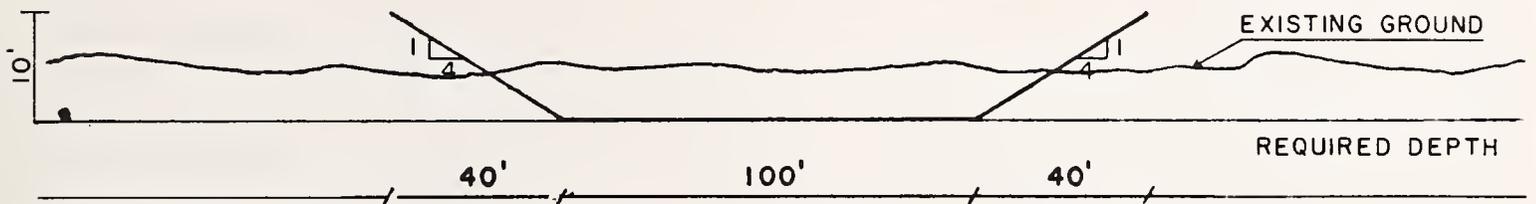
Tables 2 to 7 show the cost for each alternative. Plan, sections and geotechnical information for Alternatives 1, 4, 2 and 3 (plans I through IV) are presented in Appendix C.

Alternatives 1, 2 and 3 provide for a waterway with a minimum width of 100 feet, enough for the path of only one vessel at a time. Two turnouts are provided along the channel for passing. These turnouts would be 3,700 feet apart; the first one located about 2,375 feet east of the Constitution Bridge. Alternative 1 leaves the side slopes for the channel unprotected against wake action, while Alternatives 2 and 3 provide for protection by means of bulkheads and revetted dikes, respectively.

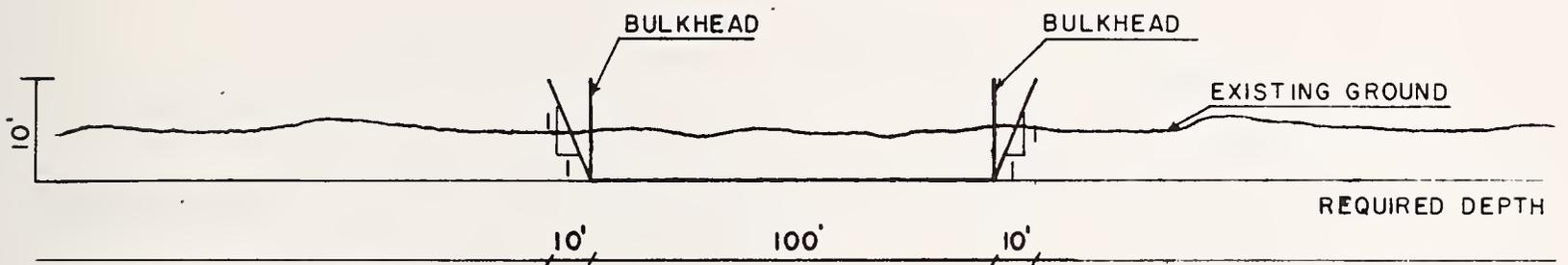
Alternatives 4 through 6 provide for a waterway with a minimum width of 180 feet, which allows vessels to pass at all points along the waterway. No turnouts are necessary. While Alternative 4 leaves unprotected the side slopes of the channel, Alternatives 5 and 6 provide for protection by means of bulkheads and revetted dikes, respectively.

CHANNEL CROSS SECTIONS FOR WATERWAY ALTERNATIVES

TYPICAL SECTION - ALTERNATIVE 1



TYPICAL SECTION - ALTERNATIVE 2



TYPICAL SECTION - ALTERNATIVE 3

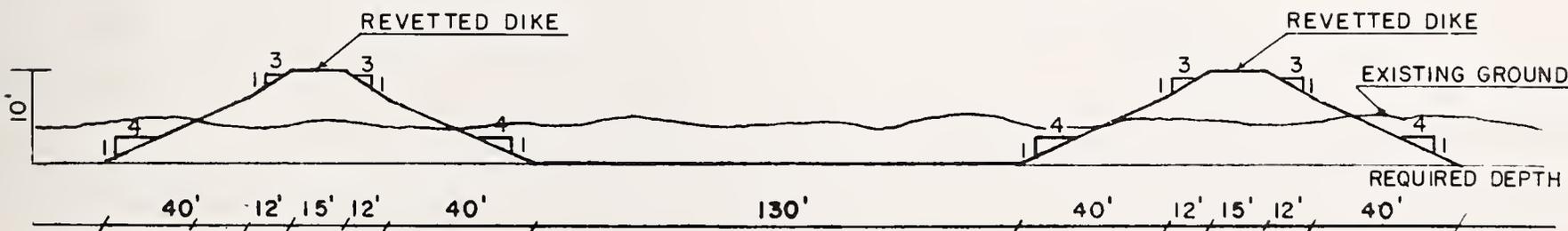
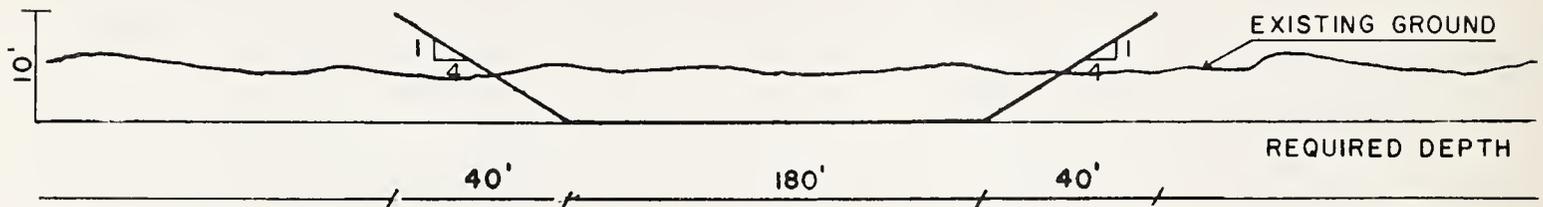


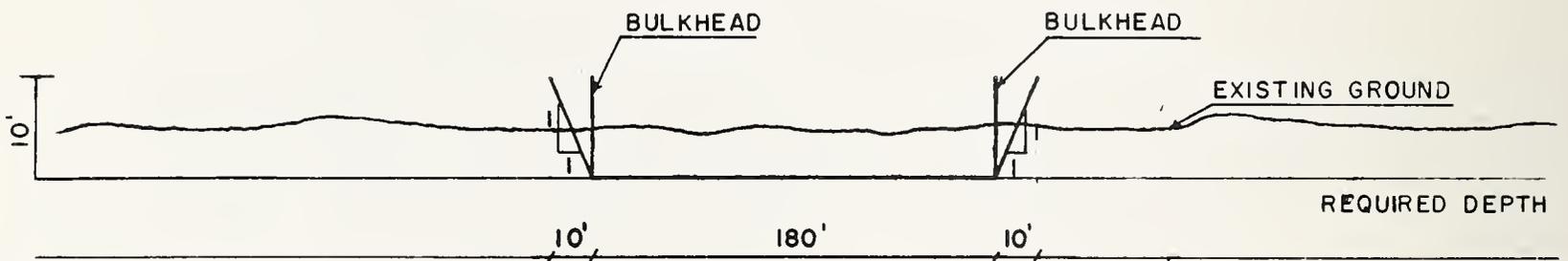
FIGURE 2-A

CHANNEL CROSS SECTIONS FOR WATERWAY ALTERNATIVES

TYPICAL SECTION - ALTERNATIVE 4



TYPICAL SECTION - ALTERNATIVE 5



TYPICAL SECTION - ALTERNATIVE 6

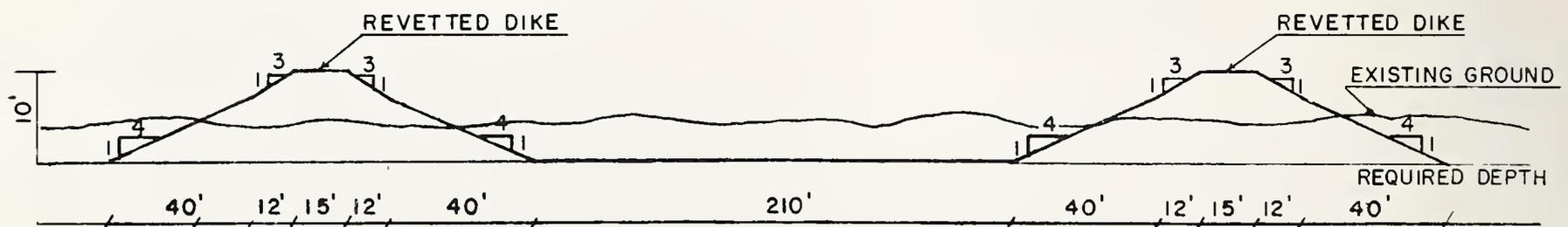


FIGURE 2-B

TABLE 2

PRELIMINARY QUANTITY AND COST ESTIMATEALTERNATIVE 1 (100-FOOT CHANNEL WITH 2 TURNOUTS)

Item	Amount
1. Mobilization & Demobilization	\$ 200,000
2. Excavation 810,000 c.y. \$5.70/c.y.	4,617,000
3. Environmental Monitoring	<u>20,000</u>
Contract Cost (including profit)	\$4,837,000

TABLE 3

PRELIMINARY QUANTITY AND COST ESTIMATEALTERNATIVE 2 100-FOOT CHANNEL WITH BULKHEAD AND 2 TURNOUTS

Item	Amount
1. Mobilization & Demobilization	\$ 270,000
2. Excavation 810,000 c.y. \$5.70/c.y.	4,617,000
3. Environmental Monitoring	20,000
4. 18" Square Precast Concrete Pile	
A. Purchase 64,200 L.F. X \$21.55/L.F.	1,383,500
B. Drive 19,200 L.F. X \$8.40/L.F.	161,300
5. Concrete Panels	
A. Purchase 52,065 L.F. X \$7.00/L.F.	364,500
B. Install 52,065 L.F. X \$4.45/L.F.	<u>231,700</u>
Contract Cost (including profit)	\$7,048,000

NOTE: Contract cost does not include contingencies or cost for supervision and administration of contract.

TABLE 4

PRELIMINARY QUANTITY AND COST ESTIMATEALTERNATIVE 3 (100-FOOT CHANNEL WITH REVETTED DIKE & BULKHEAD AND 2 TURNOUTS)

Item	Amount
1. Mobilization & Demobilization	\$ 270,000
2. Excavation	
A. Channel 810,000 c.y. \$5.70/c.y.	4,617,000
B. Dike Base 572,400 c.y. \$5.70/c.y.	3,262,700
3. Environmental Monitoring	20,000
4. 18" Square Precast Concrete Pile	
A. Purchase 6,820 L.F. X \$21.55/L.F.	147,000
B. Drive 4,100 L.F. X \$8.40/L.F.	34,500
5. Concrete Panels	
A. Purchase 5,700 L.F. X \$7.00/L.F.	40,000
B. Install 5,700 L.F. X \$4.45/L.F.	25,400
6. Dike (Sandfill) 619,000 c.y. X \$19.35/c.y.	11,977,700
7. Revetment	
A. Bedding Stone 67,135 tons X \$20.25/ton	1,359,500
B. Riprap Stone 174,675 tons X \$20.25/ton	<u>3,537,200</u>
Contract Cost (including profit)	\$25,291,000

NOTE: Contract cost does not include contingencies or cost for supervision and administration of contract.

TABLE 5
PRELIMINARY QUANTITY AND COST ESTIMATE
ALTERNATIVE 4 (180 FOOT CHANNEL)

Item	Amount
1. Mobilization & Demobilization	\$ 200,000
2. Excavation 1,172,000 c.y. \$5.70/c.y.	6,680,000
3. Environmental Monitoring	<u>20,000</u>
Contract Cost (including profit)	\$6,900,000

TABLE 6
PRELIMINARY QUANTITY AND COST ESTIMATE
ALTERNATIVE 5 (180 FOOT CHANNEL WITH BULKHEAD)

Item	Amount
1. Mobilization & Demobilization	\$ 270,000
2. Excavation 1,172,000 c.y. \$5.70/c.y.	6,680,000
3. Environmental Monitoring	20,000
4. 18" Square Precast Concrete Pile	
A. Purchase 64,200 L.F. X \$21.55/L.F.	1,383,500
B. Drive 19,200 L.F. X \$8.40/L.F.	161,300
5. Concrete Panels	
A. Purchase 52,065 L.F. X \$7.00/L.F.	364,500
B. Install 52,065 L.F. X \$4.45/L.F.	<u>231,700</u>
Contract Cost (including profit)	\$9,111,000

NOTE: Contract cost does not include contingencies or cost for supervision and administration of contract.

TABLE 7

PRELIMINARY QUANTITY AND COST ESTIMATEALTERNATIVE 6 (180 FOOT CHANNEL WITH DIKE AND BULKHEAD)

Item	Amount
1. Mobilization & Demobilization	\$ 270,000
2. Excavation	
A. Channel 1,172,000 c.y. \$5.70/c.y.	6,680,000
B. Dike Base 828,213 c.y. \$5.70/c.y.	4,720,816
3. Environmental Monitoring	20,000
4. 18" Square Precast Concrete Pile	
A. Purchase 6,820 L.F. X \$21.55/L.F.	147,000
B. Drive 4,100 L.F. X \$8.40/L.F.	34,500
5. Concrete Panels	
A. Purchase 5,700 L.F. X \$ 7.00/L.F.	40,000
B. Install 5,700 L.F. X \$4.45/L.F.	25,400
6. Dike (Sandfill) 619,000 c.y. X \$19.35/c.y.	11,977,700
7. Revetment	
A. Bedding Stone 67,135 tons X \$20.25/ton	1,359,500
B. Riprap Stone 174,675 tons X \$20.25/ton	<u>3,537,200</u>
Contract Cost (including profit)	\$28,812,116

NOTE: Contract cost does not include contingencies or cost for supervision and administration of contract.

The bulkhead system considered is precast concrete king piles with precast concrete panels. Pile penetration would be 10 to 15 feet into the clay material underlying the peat and silt materials. Pile spacing would be 10 to 12 feet. Top of piles would be elevation plus 3.0 feet mean low water (m.l.w.). The top elevation is based on one foot vessel wake and high water of about 1.5 feet above mean low water. The panels would extend from elevation plus 3.0 feet m.l.w. to elevation minus 10.0 feet m.l.w., except at locations where it is necessary to allow tidal flow into the mangroves. The top panels would be left out at these locations. The bulkhead system is not designed to withstand loading by filling on the landward side. The bulkhead system was designed to withstand a maximum boat wake of 3.0 feet when the channel tide elevation is 0.0 feet mean low water. Construction of the bulkhead system would require excavation of the navigation channel to provide access for barges to install piles and panels. The bulkhead system would be installed 10.0 feet beyond the channel bottom in order to facilitate future maintenance of the navigation channel and not damage the system.

The revetted dike system would be placed along the channel except where it is required to allow tidal flow into the existing mangroves. The above bulkhead system would be used at these locations to permit flow of water. Top of the dike would be elevation plus 4.0 feet m.l.w. The top elevation is based on one-foot vessel wake, high water of about 1.5 feet above mean low water and wave runup of 1.0 foot. The toe of the revetment would be placed 10.0 feet beyond the channel bottom to facilitate future maintenance dredging. The side slopes would be 1 vertical on 3 horizontal above 0.0 feet m.l.w. and 1 vertical on 4 horizontal below 0.0 feet m.l.w. Excavation of the peat and silt to elevation minus 10.0 feet m.l.w. across the base of the dike would be required prior to construction of the dike. Subsidence of about six feet can be expected. The revetment would consist of 9 inches of filter bedding stone and 20 inches of riprap stone above 0.0 feet m.l.w. and 12 inches of filter bedding stone and 30 inches of riprap stone below 0.0 feet m.l.w. Bedding stone gradation of 3-inch maximum size with no greater than 10 percent passing a No. 100 sieve. Riprap stone gradation would be W50 of 160 pounds.

In terms of service to the user, the 100-foot Alternatives 1 through 3 would bring a lower level of service to the users than the 180-foot alternatives. Should a ferry vessel meet other ferry vessel in the opposite direction, it might stop in the turnout up to five (5) or six (6) minutes. The ferry trips could be scheduled so as to avoid such situation. However, private vessels and vessels of public service such as police and coast guard can not be controlled so as to avoid the situation. Since the number, timing, and interference of the non-ferry vessels is unpredictable, the seriousness of the problem can not be anticipated. If those users do not practice responsible behavior, troublesome and dangerous situations may result. For example, a sailboat between the turnouts, would cause the ferry to either pass it dangerously or wait for a long time until the sailboat reaches the turnout.

On the other hand, the costs of mitigating this situation by widening the channel to 180 feet are \$2,063,000 (30%) or \$3,521,116 (12.2%) higher than for the three 100-foot alternatives, due to the greater excavation necessary.

From the environmental point of view, in general the 180-foot alternatives require the elimination of a greater area of mangrove. This aspect is discussed in detail in Chapter IV, Section G.

The 100-foot Alternatives 2 and 3 and 180-foot Alternatives 5 and 6 include measures to alleviate possible damage to existing mangroves along the channel from erosion due to vessel wakes. The design vessel wake is 1.0 foot in the channel. In addition, the bulkhead method would allow steeper side slopes and as a consequence, the area of mangrove to be destroyed at both sides would be less. Both measures (bulkhead and revetted dike) would also help alleviate shoaling of the navigation channel as a result of bank erosion. However, shoals would tend to form in the channel from material carried by existing drainage canals entering the channel and from the easterly portion of the Martin Pena Channel. Maintenance dredging in the future should be expected.

Table 21 shows a relation of costs and area of mangrove required by each alternative.

High voltage overhead electrical transmission lines cross the proposed channel at two locations. The lowest wire crosses about 8 feet above the water. The transmission lines would have to be raised to provide adequate safety during construction and operation.

There are three bridges crossing the proposed navigation channel, the Constitution Bridge (John F. Kennedy Avenue) and the two Las Americas Freeway Bridges. Fender systems for the navigation channel have been installed on the three bridges. Given below are the horizontal and vertical clearances (at centerline) at the bridges:

	<u>Horizontal</u>	<u>Vertical</u>
Constitution Bridge	100'	23.0'
Las Americas Freeway (2)	106.7'	23.5'

In order not to damage the fender system it is necessary that channel widths through the three bridges be reduced to 80.0 feet.

2. Busway

Four (4) alternatives are under consideration for the busway service to be provided from the intermodal terminal to Bithorn-Clemente Sports Complex, through the New Center of San Juan. Appendix B shows the alignment for each alternative, which are briefly described as follows:

Alternative 1

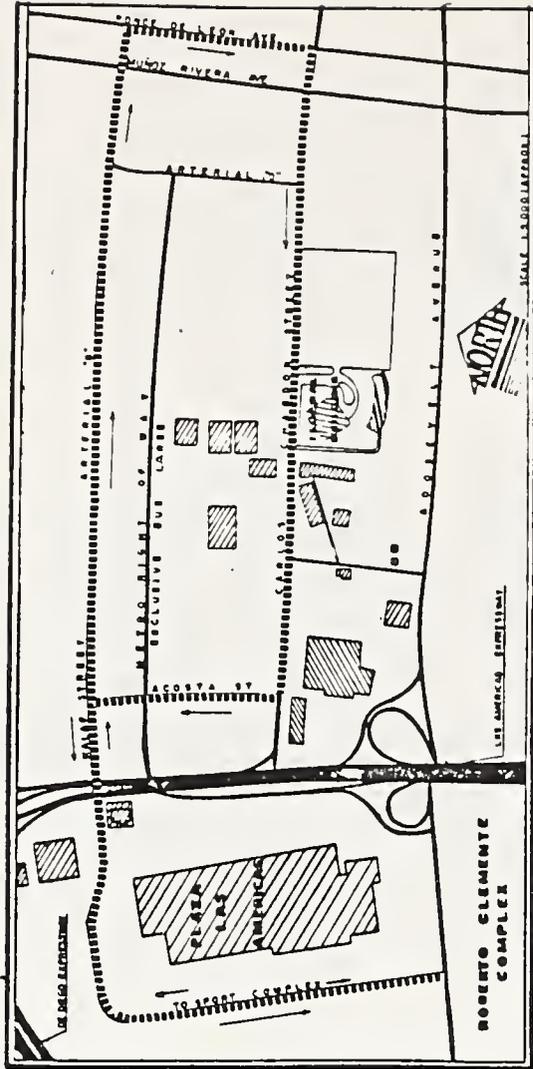
This alternative would place the feeder bus route running from Hato Rey to the parking lots of the Bithorn-Clemente Sports Complex along an alignment starting from Munoz Rivera Avenue, going west on newly constructed Arterial B, one block to the ferry terminal; South on existing Arterial D, one half block; west on a busway, to be constructed on the proposed Metro right-of-way and along the east side of Las Americas Expressway or in mixed traffic on Acosta Street; west on Kalaf Street, using a widened underpass; south on Las Americas Shopping Center main street up to the Bithorn-Clemente Sports Complex parking lot. The buses would operate in mixed traffic on Arterials B and D and on Kalaf and Plaza Las Americas streets. The rest of the route would be on exclusive bus lanes. The total length of this route is approximately 3,170 meters.

Arterials B and D are elements of the New Center street system. These streets will be six lane arterials. The unbuilt segments of these streets which would be used for this alternative would be constructed as part of the project. Kalaf and Plaza Las Americas Streets are four lanes.

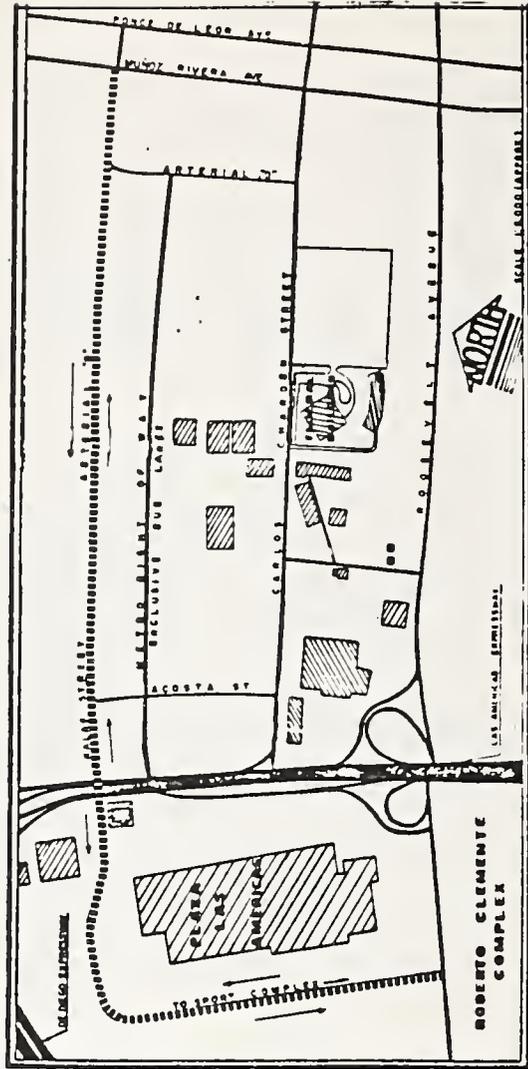
Alternative 2

This alternative contemplates the use of contra-flow exclusive bus lanes. The route would start at the ferry terminal, going east on Arterial B and Ochoa Street; south on Ponce de Leon Avenue, using the existing contra-flow exclusive bus lane; west on Chardon Street, north on a busway 350 meters long to be constructed along the east side of the Las Americas Expressway or in mixed traffic on Acosta Street; west on Kalaf Street, south on Las Americas Shopping Center main street up to the Bithorn-Clemente Sports Complex parking lots. From this point, the buses return to the ferry terminal, but using Arterial B instead of Chardon Street.

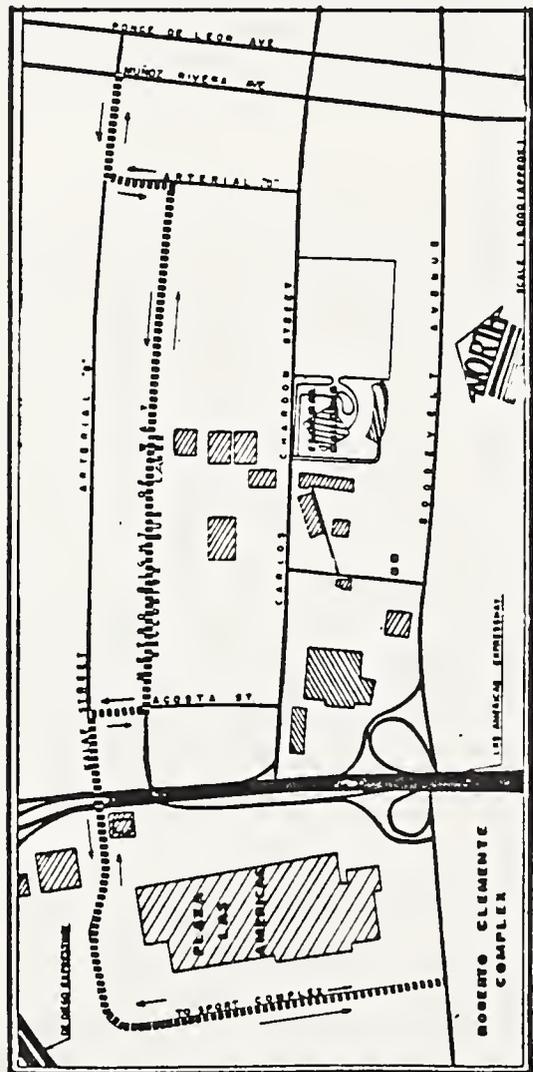
The buses would operate on exclusive bus lanes against traffic flow on Ponce de Leon Avenue, Chardon Street, Kalaf Street (300 meters between Acosta and Cesar Gonzalez Streets), and Arterial B. The unbuilt segments of Arterial B which would be used for this alternative would be constructed as part of the project.



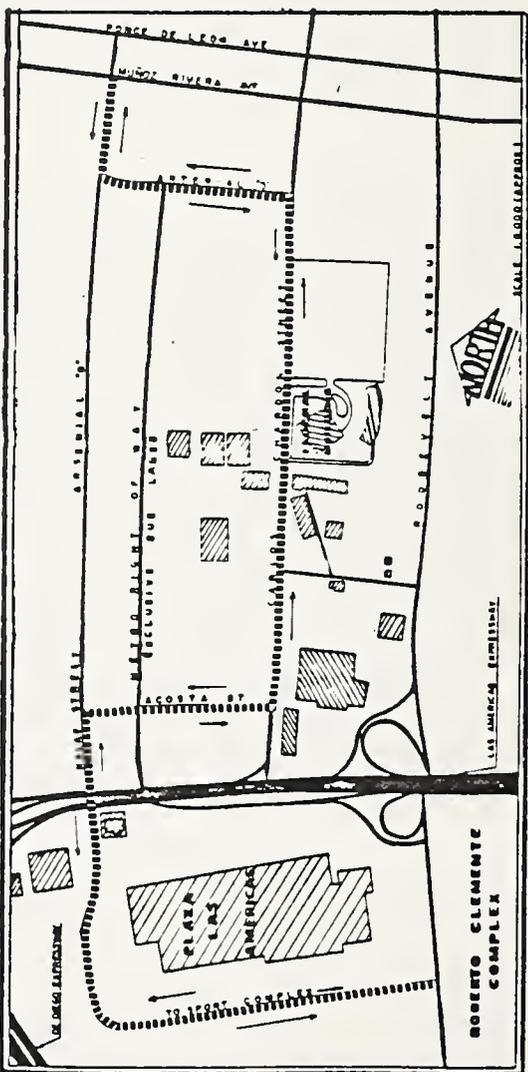
ALTERNATIVE 2



ALTERNATIVE 4



ALTERNATIVE 1



ALTERNATIVE 3

BUSWAY ALTERNATIVES
FIGURE 3

Alternative 3

This alternative would start on Munoz Rivera Avenue going west on Arterial B, then turn southerly on Arterial D to connect Chardon Street. It would then proceed westward on Chardon Street up to Acosta Street, where it turns north to connect Kalaf Street. It would continue westward on Kalaf Street, then turn southerly on Las Americas Shopping Center up to the Bithorn-Clemente Sport Complex parking lots. In this alternative the buses would operate in mixed traffic. The unbuilt segments of Arterials B and D to be used for this alternative would be constructed as part of the project.

The total length of this route is 3240 meters approximately.

Alternative 4

This alternative would run in mixed traffic on Arterial B, Kalaf and Canales Streets from the ferry terminal up to the Bithorn-Clemente Sports Complex parking lots. The total length of this route is 2970 meters approximately. The unbuilt segments of Arterial B that would be used for this alternative would be constructed as part of the project.

Construction and acquisition itemized costs are presented in Tables 8 and 9, respectively. The total cost for Alternatives 1 and 4 is nearly the same. Alternatives 2 and 3 are approximately 29% and 55% more expensive, respectively.

Table 9 contains information about the acquisition of land and structures required for the construction of each alternative. The alternative requiring the least land is number 4, followed by number 2, 1 and 3. Alternatives 1, 2, 3 and 4 require the acquisition of 1, 10, 5 and 2 structures, respectively. All structures to be acquired are commercial (primarily offices).

The owners and tenants of the properties to be acquired under selected alternative would be entitled to the benefits stated in the Uniform Relocation Act.

Relocation of utilities would be necessary for every alternative to some extent.

Fifty three (53) parking spaces need to be taken at Plaza Las Americas Shopping Center under all alternatives.

Alternatives 2 and 4 would affect the driveways of the existing factories on Kalaf Street, which are presently used for parking. It is estimated that about 91 parking spaces would be eliminated, including those on the street.

Table 8

ITEMIZED CONSTRUCTION COSTS OF
BUSWAY ALTERNATIVES

ITEM	ALTERNATIVE NUMBERS			
	1	2	3	4
1 Move to the site	204,453	184,988	308,440	192,526
2 Field office	10,000	10,000	10,000	10,000
3 Lab & Tests	30,000	30,000	30,000	30,000
4 Borings	18,000	18,000	18,000	18,000
5 Clearing & Grubbing	4,000	5,500	4,900	5,300
6 Survey & stakeout	50,000	50,000	50,000	50,000
7 Barricades	2,500	2,500	2,500	2,500
8 Cones	2,500	2,500	2,500	2,500
9 54 Gals. Drums	2,500	2,500	2,500	2,500
10 Flagman	15,000	15,000	15,000	15,000
11 Lighting Grilles	1,000	1,000	1,000	1,000
12 Watchman	80,000	80,000	80,000	80,000
13 Removal of soil	491,090	144,830	450,330	324,643
14 Demolition	43,060	81,500	63,500	70,000
15 Uncl. Exc.	57,312	33,200	49,200	42,500
16 Uncl. Exc. for Str.	112,800	152,620	248,420	77,100
17 Compacted fill	690,528	484,045	1,461,645	1,038,864
18 Raising of Exist. Utils.	25,900	73,500	72,500	50,000
19 Bit. surface	374,422	618,305	587,672	431,200
20 Base Course	222,982	217,160	277,840	307,520
21 Curbs & Gutters	77,264	88,400	110,800	70,000
22 Side Walk	150,996	195,800	253,200	221,000
23 Planting Strip	16,968	63,400	69,800	49,000
24 Car Entrances	18,868	25,080	35,880	23,400

Table 8 (Cont.)

ITEMIZED CONSTRUCTION COSTS OF
BUSWAY ALTERNATIVES

ITEM	ALTERNATIVE NUMBERS			
	1	2	3	4
25 Class A Conc.	160,000	160,000	196,000	160,000
26 Fences	112,900	119,200	138,400	55,000
27 Landscaping	34,652	62,500	78,500	48,700
28 Signs	14,760	16,000	15,000	14,500
29 Lane Markers & Paint	5,390	10,600	13,240	4,380
30 18" Conc. Pipes	31,572	114,750	124,200	27,000
31 M H'S	7,920	7,500	16,500	4,500
32 Catch Basins	12,924	19,400	28,400	39,000
33 Conc. in Box Section	482,800	360,000	1,140,000	280,000
34 Piles	32,000	32,000	32,000	32,000
35 Inlet Structure	3,780	6,000	9,000	3,000
36 Outlet Structure	5,040	4,000	9,040	4,000
37 Underdrains	44,640	28,000	92,000	68,000
38 Reinf. Steel	231,216	177,100	433,700	167,000
39 PRASA Utilities	38,634	33,100	67,000	102,100
40 Remodelling	-	50,000	-	-
41 Electrical	321,478	515,850	564,050	352,150
SUBTOTAL	4,747,849	4,295,828	7,162,657	4,470,883
15% Eng. & Supervision	712,177	644,374	1,074,398	670,632
CONSTRUCTION COST	5,460,026	4,940,202	8,237,055	5,141,515
ACQUISITION	2,310,450	4,737,625	3,499,625	2,181,500
GRAND TOTAL	7,770,476	9,677,827	11,736,680	7,323,015

TABLE 9

PROPERTY ACQUISITION - BUSWAY ALTERNATIVES

Busway Section	Alternatives	Land Acquisition			Structures Acquisition			Total Cost (\$)
		Area (M ²)	Use	Cost (\$)	Number	Use	Cost (\$)	
Arterial B (Muñoz Rivera - Arterial D)	1, 2, 3, 4	6, 701	Vacant	667, 500	1	Commercial (Offices)	283, 000	950, 500
Arterial D (Arterial B - Chardón)	3	17, 800	Vacant	712, 000	---	---	---	712, 000
Arterial D (Arterial B - Metro)	1, 3	4, 650	Vacant	186, 000	---	---	---	186, 000
Chardón Street (Arterial D-Acosta St.)	2, 3	4, 000	Commercial Yard	1, 000, 000	4	Commercial	276, 125	1, 276, 125
Acosta Street (Chardón-Arterial B)	2, 3	1, 000	Vacant and pipe stock	125, 000	-	---	---	125, 000
Metro R.O.W. (Arterial D-Acosta St.)	1	11, 000	Industrial	880, 000	-	---	---	880, 000
Acosta Street (Metro R.O.W. - Arterial B)	1	350	Pipe Stock	43, 950	-	---	---	43, 950

TABLE 9 (Cont.)

PROPERTY ACQUISITION - BUSWAY ALTERNATIVES

Busway Section	Alternatives	Land Acquisition			Structures Acquisition			Total Cost (\$)
		Area (M ²)	Use	Cost (\$)	Number	Use	Cost (\$)	
Ponce de León - Muñoz Rivera & Chardón (Muñoz Rivera - Arterial D)	2	1,800	Commercial	405,000	4	Commercial (Offices)	750,000	1,155,000
Arterial B (Arterial D-Acosta St.)	2,4	5,500	Vacant	805,000	1	Commercial (Offices)	176,000	1,043,500
Canales Street (Acosta St.-Roosevelt)	1,2,3,4	2,000	Parking	250,000	---	---	---	250,000

Total: Alternative 1	-----	24,701	---	2,027,450	1	---	283,000	2,310,450
Alternative 2	-----	21,001	---	3,252,500	10	---	1,485,125	4,737,625
Alternative 3	-----	36,151	---	2,940,500	5	---	559,125	3,499,625
Alternative 4	-----	14,201	---	1,722,500	2	---	459,000	2,181,500

To compensate for this, under all alternatives, parking facilities would be provided on vacant land available in the south-east corner at the intersection of Kalaf Street and Las Americas Freeway.

Alternative 1 would affect the delivery areas of existing industries near Cesar Gonzalez Street. Should this alternative be selected, new loading areas would have to be provided.

Service to users should be should be evaluated on the basis of 1) travel time, and 2) accessibility of service.

There is no significant difference in route length among the different alternatives. Therefore, differences in travel time will be determined by the portion of the route in mixed traffic compared to the portion on exclusive bus lanes. All the alternatives are expected to render the same initial reduction in travel time when compared to existing conditions. However, as New Center develops, traffic congestion will continue to increase and the exclusive bus lane alternatives will become highly advantageous. Although none of the alternatives run totally on exclusive lanes, Alternatives 1 and 2 rely more heavily on them.

The busway will serve as a feeder to the ferry service. In addition the busway will provide local service connecting the intermodal terminal, Plaza Las Americas and the Bithorn-Clemente Sports Complex. This service will also connect the Hato Rey Office District and the residential developments in the northern area of the New Center.

Busway Alternatives 4 and 1 which run furthest to the north would be more accessible to such areas. The alternative which best meet both travel time and access criteria is number 1.

The impact of busway alternatives in terms of noise, air quality and energy consumption is assessed in Chapter IV. Busway alternatives are compared in Table 10. An overall rating is provided, which considers service, socio-economic and environmental impacts.

TABLE 10
BUSWAY ALTERNATIVES RATING¹

Alternative	Service		Socio-economic Impact					Environmental Impact				Overall		
	Travel Time 1985	Distance from Potential Users	Cost	Land Acquisition	Structures Acquisition	Industries Operation Disturbance	Taking of parking areas	Noise		Air Quality			Energy	
								During Constf.	During Operat.	During Constf.	During Operat.		1985	2000
1	1	2	1	2	1	2	1	2	1	2	1	2	2	21
2	1	3	2	4	4	1	2	1	1	1	1	1	1	24
3	2	4	3	3	3	1	1	1	1	1	1	2	2	29
4	2	1	1	1	2	1	2	1	1	1	1	2	2	22

¹ The alternatives are rated from 1 to 4. For service items, a rate of 1 indicates the higher level of service and 4 indicates the lower level of service. In the case of impacts, 1 represents the less impact and 4 represents the greatest impact. Therefore, in the overall, the lower cipher should represent the best alternative while the higher cipher should represent the worst alternative.

3. Terminals

The proposed project includes the construction of a main intermodal terminal at the east end of the waterborne system.

The terminal will be located in Hato Rey near Munoz Rivera and Ponce de Leon Avenues, the major arterials of the Santurce-Rio Piedras corridor. It is also located near the exclusive bus lanes which constitute the public transportation spine of the area. The proposed terminal will integrate the ferry service with other transportation systems serving the New Center area.

Three alternative locations are under consideration for this terminal (See Figure 4). Alternative 1 is located east of Ochoa Channel, closer to Munoz Rivera Avenue. Alternative 2 is located south of Ochoa Channel, closer to the Banking Center of Hato Rey, while Alternative 3 is located west of the Ochoa channel, and closer to the residential area of the New Center of San Juan.

Alternatives 1 and 2 are located on private land, while number 3 is located on the publicly owned lands in Barrio Tokio. Parking facilities for all alternatives will be provided in the Barrio Tokio area.

No significant environmental differences are anticipated for the three alternatives.

The terminals proposed at Old San Juan and Catano are those presently in use for the existing San Juan-Catano ferry service. Minor improvements to these terminals are proposed. However, no environmental consequences are anticipated due to those improvements.

Other terminals could be provided at intermediate points in the future, if justified. However, they would be considered a separate action.

C. THE LOCALLY PREFERRED ALTERNATIVES - WHY PREFERRED

After intense consultations and negotiations with state, federal and local agencies and groups with an interest in this project the Puerto Rico Department of Transportation and Public Works has selected a preferred alternative for each component of the proposed project. These preferred alternatives are described below.

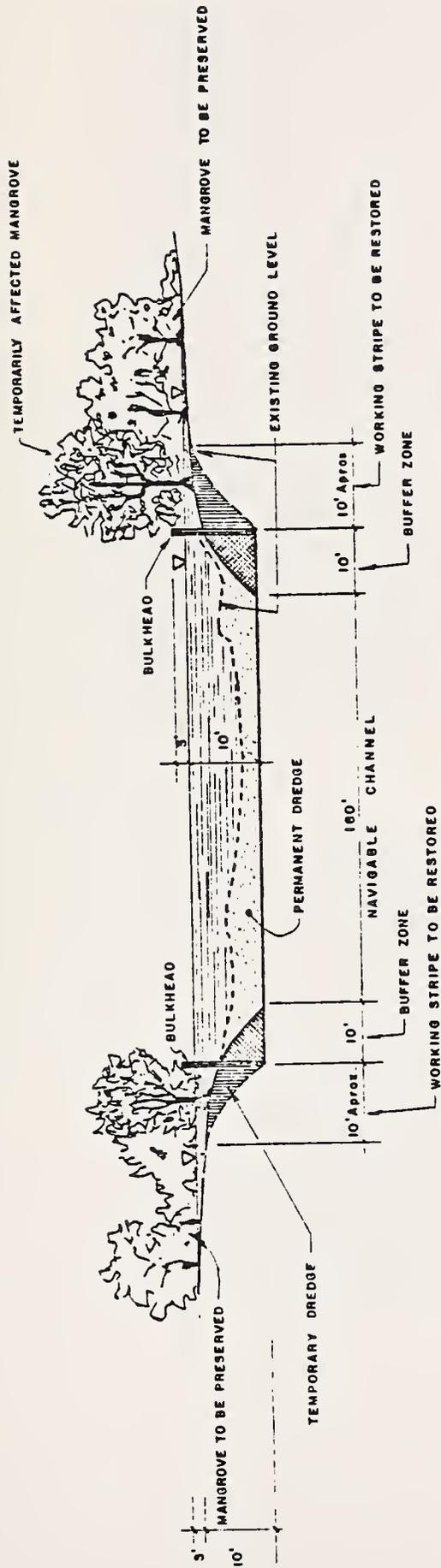
1. Waterway

The preferred waterway alternative is number 5: the two-way 180 foot wide channel with bulkheads. No turnouts are necessary. Figure 4A shows the typical cross and longitudinal sections for the preferred alternative. Although the navigable width is 180 feet, a buffer zone 10 feet wide, will be provided at both sides, for a total channel width of 200 feet between both bulkheads.

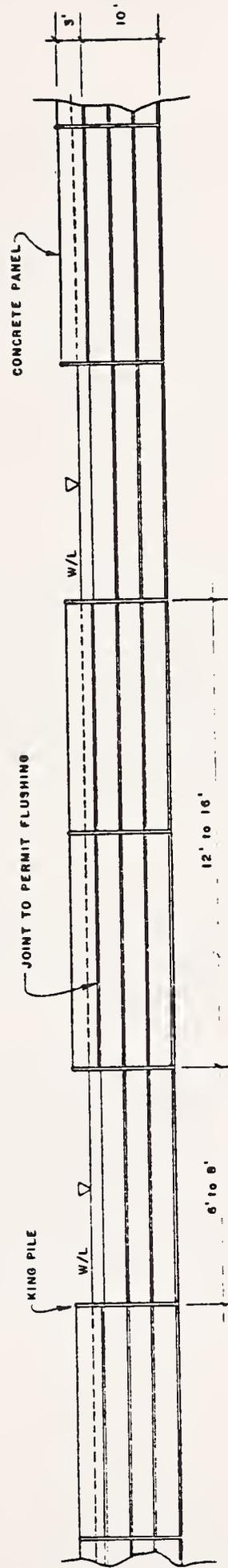


ALTERNATIVES TO THE LOCATION
OF THE HATO REY TERMINAL

FIGURE 4



TYPICAL CROSS SECTION - PREFERRED ALTERNATIVE



TYPICAL LONGITUDINAL SECTION - PREFERRED ALTERNATIVE

The 100 foot alternatives (1 through 3) were not preferred because of their lower level of service to users. These alternatives allow only one vessel to pass at a time, causing possible delays and dangerous situations.

All the other three alternatives, 4 through 6, would provide two-way 180 foot channels. Number 5 was preferred over Alternative 6 for cost and environmental reasons and over Alternative 4 for strictly environmental considerations. The cost for Alternative 6 would be more than three times that for the preferred alternative and it would take nearly seven times more mangrove area. On the other hand, Alternative 4 would cost nearly 2.2 million dollars less than the preferred alternative, but it would require the permanent elimination of 14.13 acres of mangroves while the preferred alternative requires only 6.36 acres. In addition, the preferred alternative will provide for the protection of the existing channel shores against the wake action and also, allows the flushing of the remaining mangrove alongside the channel.

Dredging of an additional stripe, approximately 10 feet wide, beyond bulkheads will be necessary during construction on both sides. However, once the bulkheads are constructed, that stripe will be restored to its original condition. Furthermore, the bulkhead will allow mangroves to grow right up to the edge of the channel thus permitting an actual increase in mangrove acreage over present conditions. Because of the slope of the channel sides in Alternatives 1 and 4 (without dikes or bulkheads) this would not be possible.

2. Busway

The preferred busway alternative is number 1. This is the best alternative considering the combined factors of level of service, socio-economic impact and environmental impact, which are presented in Table 10.

The preferred alternative requires the acquisition of 6.18 acres of private land and part of one structure. The structure is located at northwest corner of Munoz Rivera Avenue and Ochoa Street and the part to be acquired had been used as workshop by Condado Window Co. until it was burned down very recently. The other alternatives need from 3.55 to 9.04 acres of private lands and from two to ten structures. The total cost of the selected alternative is the second lowest, \$7,770,476 only \$500,000 higher than the least expensive.

In terms of service to the users, two criteria were evaluated: travel time and accessibility of service. The preferred alternative is the one that better meet the first criteria since it relies more on exclusive lanes straight through the New Center of San Juan by using the Metro right-of-way. In addition, it is more accessible to the residents of the New Center than Alternatives 2 and 3. The accessibility of Alternative 4 is a little bit better than that the selected alternative, but the buses would run in mixed traffic on Arterial B, increasing the travel time in comparison to the exclusive lane service of the preferred alternative.

In terms of environmental impact, no significant differences exist among the four alternatives.

3. Terminals

The terminals proposed at Old San Juan and Catano are those presently in use for the existing San Juan-Catano ferry service.

Of the three alternative locations under consideration for the main intermodal terminal at Hato Rey, the one to the west of the Ochoa Channel offers the advantage of not taking private lands. However, in terms of environmental impact, no difference is expected for any of the alternatives. Therefore, the selection of any alternative is unnecessary at this time. A design and technical study is now underway which will provide the information necessary to make the final decision on the terminal location based on cost and operational considerations.

CHAPTER III

SOCIO ECONOMIC AND ENVIRONMENTAL SETTING

A. NATURAL ENVIRONMENT

1. Meteorology and Climatology

Being a tropical island, Puerto Rico's temperature changes from the warmest to the coolest season are slight. The average number of days per year with a temperature of 90 degrees or more for the city of San Juan is nine days. In old San Juan, which is surrounded by water, the coolest temperature recorded is 62 degrees. Table 11 shows monthly recorded temperatures for the city of San Juan. Figure 5 shows mean annual temperature for the Island.

Rainfall varies markedly from place to place over a relatively short distance. A large percentage of rainfall is due to topographic induced upward deflections of the air currents. The greatest amounts of rainfall are recorded at the east and west ends of the Island. The months with the least rainfall are February and March. From May to October the highest levels of temperature and rainfall are recorded. Table 11 shows precipitation norms for San Juan and Figure 6 shows mean annual precipitation for the Island.

The northeast trade winds prevail throughout the entire year. These winds blow from an easterly direction and their frequency decreases progressively as they deviate from the east. Winds blowing from westerly are negligible in frequency and velocities. Winds are more consistently easterly in the summer months, attaining maximum frequency in July, when the east winds blow 68 percent of the time. The greatest deviations from the pattern of wind dominance are in October, when the east wind blows only 34 percent of the time. The minimum recorded average wind velocity during the year is 8.2 miles per hour in the month of October.

TABLE 11

MONTHLY TEMPERATURE (30 YEARS), PRECIPITATION (30 YEARS) AND RELATIVE HUMIDITY

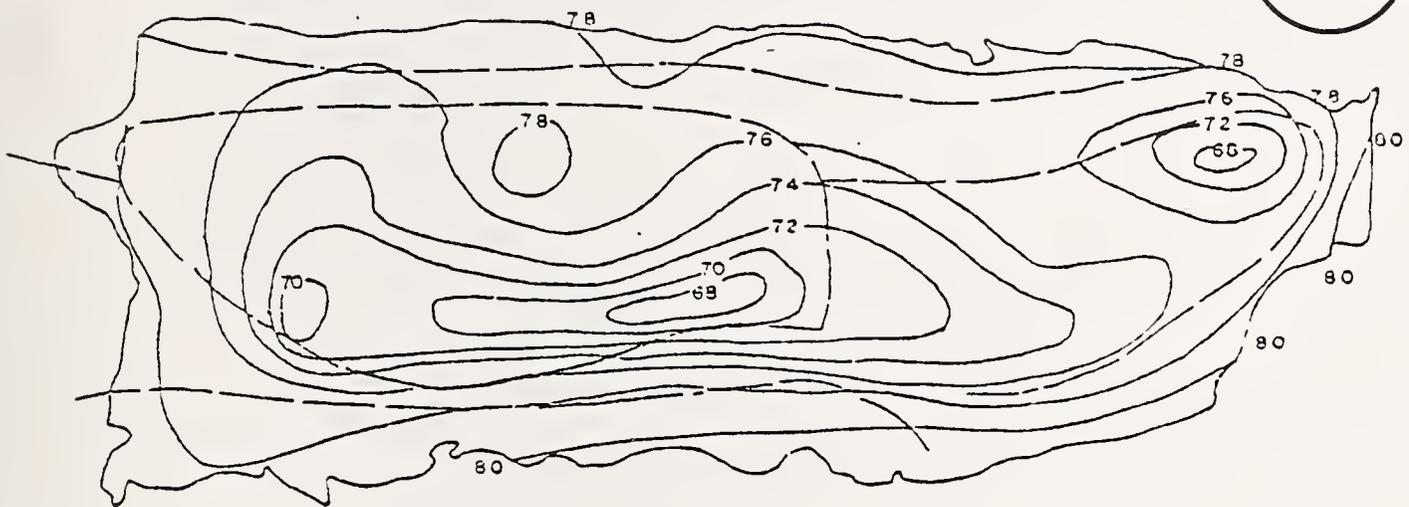
(23 YEARS) IN SAN JUAN, PUERTO RICO

Month	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Annual
Temperature (°F)	74.5	74.3	75.4	76.6	78.8	79.9	80.4	80.8	80.6	80.1	78.3	76.3	78.0
Relative Humidity (%)	76	74	74	74	77	78	78	78	79	79	78	77	77
Precipitation (Inches)	4.69	2.87	2.21	3.70	7.13	5.67	6.26	7.13	6.77	5.83	6.46	5.47	5.35

* SOURCE: U.S. Weather Bureau

MEAN ANNUAL TEMPERATURE

ATLANTIC OCEAN



CARIBBEAN SEA

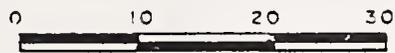


Figure 5

MEAN ANNUAL PRECIPITATION

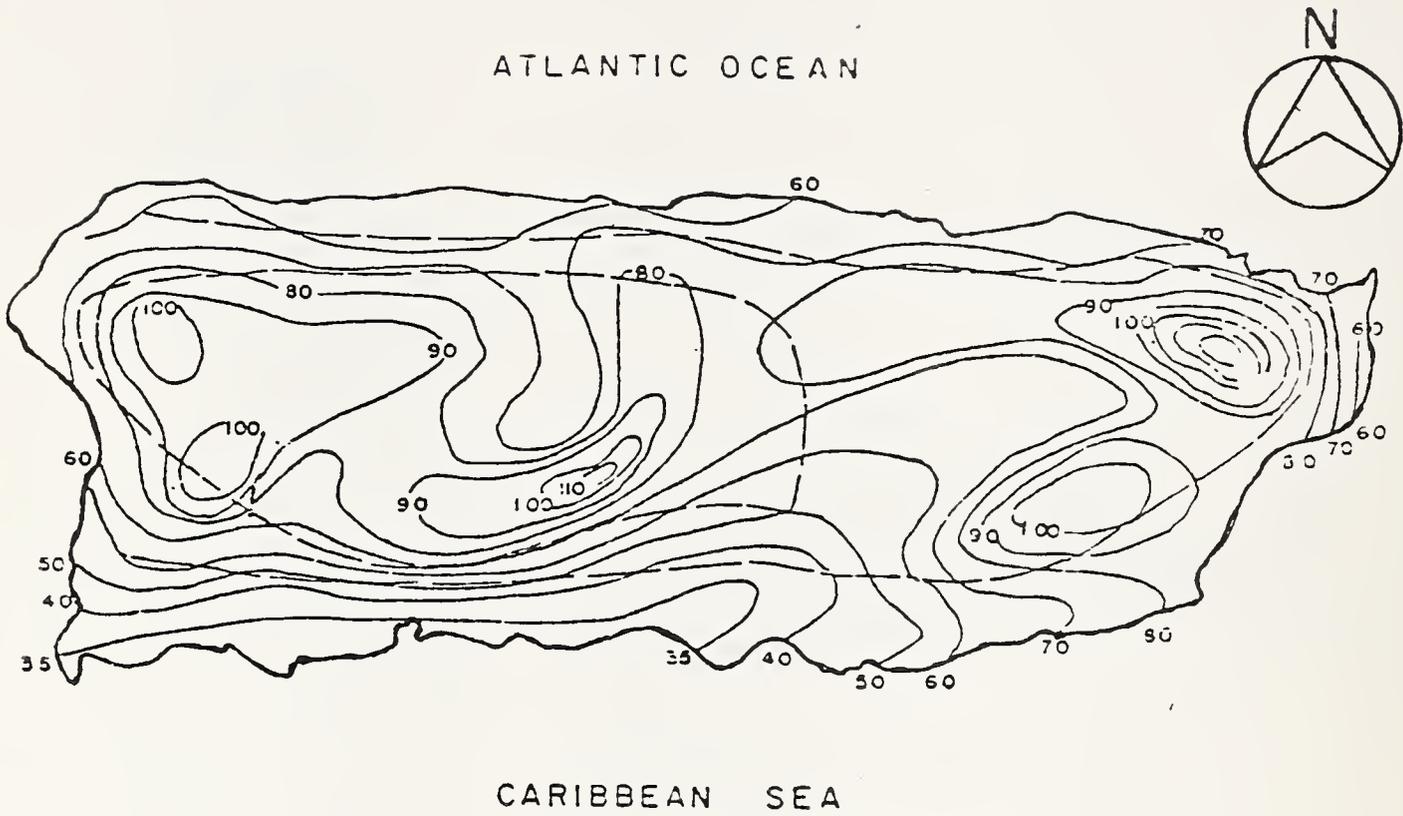


Figure 6

2. Flora and Fauna

a) Flora

The natural ecosystems of Martin Pena Channel are those characteristic of tropical wetlands (Appendix A). Two biological systems have been identified as particularly sensitive, the red mangroves lining the channel and the mudflats in the channel and near the Constitution Bridge. These two biological systems have been identified as the most critical wildlife habitats within the project area.

The dominant plant community of the channel itself is riverine mangrove, in which the red mangrove (Rhizophora mangle) prevails. Another three species are present in the Martin Pena Channel, Avicennia germinans (black mangrove), Laguncularia racemosa (white mangrove) and Conocarpus erectus (buttonwood). In disturbed areas, the leather ferns (Acrostichum aureum) and A. danefolium are also found. The presence of these two species indicates saline soil conditions.

Riverine mangrove systems exhibit rapid growth and high productivity and are characterized by high nutrient and fresh water inputs. They are open ecosystems, exporting large quantities of particulate and dissolved organic matter to coastal waters.

Although the Martin Pena mangrove ecosystem has been altered, it still contributes to the local environment in different ways. It serves as a buffer that stores flood waters during periods of high rains, possibly reducing flood and channel scour downstream and to some degree impeding the sedimentation of San Juan Bay. The mangroves are also the only natural forest system of any significance that still survives in the heart of Hato Rey and represents a "lung" for the city. The fast growing mangrove trees undoubtedly detoxify the aquatic system to some degree, removing excess nutrients and toxic substances and immobilizing them in living tissue, preventing such substances from entering the aquatic food chain. Mangroves also provide essential feeding, resting and nesting habitat for many bird species, both resident and migratory, including many resident wading birds and the Brown Pelican. The wading birds heavily use of the mangrove-lined edges of the channels.

Many areas in the immediate vicinity of the Martin Pena Channel are filled areas formerly in mangroves. In some of these areas, fill has become compacted or has sunk so that the land once again floods frequently. These areas are known as swampy savanna. This is another wetland type of system dominated by herbaceous plants instead of trees. There are many subtypes and all of them

indicate permanent or semi-permanent flooding. Most swamp-savanna associations are secondary (successional) as a result of prior human interference. They are indicators of flooding and muck soil and cannot be developed without filling and draining. The benefits offered by these type of system include storage, buffering, gradual release of floodwaters, export of organic matter to coastal ecosystem and absorption of excess nutrients and some toxics. They also help in the settling of sediments carried to the coast during episodes of heavy rain from nearby streams and urban drainage systems and as a habitat, food and nesting area for some wildlife species.

The remainder of the open areas in the project vicinity are dominated by a mixture of native and exotic species. Most are either original uplands not subject to flooding, or areas formerly classified as wetlands that have been filled repeatedly so that the present vegetation is not of wetland type. There are two endangered bird species in the area and no known endangered plants or animals. Common grasses and scattered trees are found in the area including the mango (*Mangifera indica*), coconut palm (*Cocos nucifera*) and others.

There are areas of extremely shallow water along most of Martin Pena Channel where mud is exposed during low tide. These areas of fine sediment accumulation are called mudflats.

b) Fauna

The inventory of animals (Table A-4) includes both terrestrial and aquatic organisms, as most of the project area constitutes wetland habitat. The following groups are included:

(1) Birds

Birds are the most diverse and abundant group of land and aquatic animals in Martin Pena Channel. The mudflats of that zone are among the best areas in all Puerto Rico for sighting shore-birds, gulls and terns. It probably supports the greatest diversity and concentration of birds anywhere on the Island. As many as 5,000 birds have been observed on the few acres of flats at a single time and 70 avian species have been recorded from the locality to date. The Caspian Tern, Forster's Tern, Cayenne Tern, Ring-billed Gull and Black-headed Gull are seen regularly at Constitution Bridge while most of the occur only occasionally elsewhere on the Island.

A small peninsula of mangrove near the mouth of the channel is currently the breeding site of at least 2,000 cattle egrets. The whole area represents a feeding and roosting

place for a great number of migratory birds, especially shorebirds and wood warblers. Approximately 250 brown pelicans depend on this area for feeding and roosting and up to 1,000 have been counted in one day. The pelicans use mangroves lining the channel and San Juan Bay as loafing and roosting areas. They have been classified as endangered species by federal and state laws since October 10, 1970.

Another endangered species, the Yellow-shouldered Blackbird, has been observed in that area.

Of all the higher vertebrates, birds are indisputably the best adapted to exploit the mudflats since only they can cope with a substrate that is both liquid and solid. These places are used as "staging posts" by many species of birds during their migration. The area not only serves as an optimal feeding site but also as a resting place. The mudflats represent a quiet and safe place to rest when the birds most need it and, simultaneously, a place where the bird can increase his energy reserves, which are extremely important to cope with the moulting energy requirements and to continue migration.

(2) Mammals

The only mammals found in the area were the black rat (Rattus rattus) and the mongoose (Herpestes auropunctatus). Both species were introduced centuries ago to the Island. The black rats are common in the mangrove forest where some nests were seen in the trees. The mongoose lives in the savannas and wanders into the mangrove forest. Both are basically "nuisance" organisms. The mongoose, in particular, is known to be a vector of rabies and a predator of groundnesting birds and other vertebrates. Mongooses are particularly common in open areas near the dump.

(3) Reptiles and amphibians

Among the reptiles observed in the area are the lizards Anolis cristatellus, A. stratulus and A. pulchellus. The first two are observed in the mangrove trees. Anolis pulchellus are found in the grasses of the upland and filled areas. None are rare or endangered.

Four amphibians can be observed. The common marsh frog Leptodactylus albilabris is particularly abundant in the small ditches formed in some swampy savannas. The introduced toads, Bufo marinus, are observed around the swampy savannas and in the upland areas.

(4) Crustaceans

The most commonly observed crustaceans are the fiddler crabs (Uca. spp.). They are very abundant on the mudflats and along the shore of the channel, reducing in number as one moves inland. Goniopsis cruentata and Aratus pisonii are the most abundant crabs in the mangrove swamp. Both species climb the roots of the red mangrove. In rocky areas Grapsus grapsus are found. All of these species are important food items for large wading birds, herons and egrets.

Around the mangrove swamp are land crabs Cardisoma guanhimu. This crab, once very abundant through the coastal plains of the Island, is rare at present and in some places its population has been reduced rapidly during the last twenty years. It is not presently considered threatened or endangered, however.

(5) Fish

The aquatic habitat of Martin Pena Channel, lower Puerto Nuevo River and the southeast corner of San Juan Bay is already highly altered by human intervention. This fish community is simple, as would be expected in a highly eutrophicated estaurine environment.

Table A-2 shows the results of an experimental capture carried on during December, 1982, to evaluate the fish community composition of the channel. Three areas were sampled: Martin Pena Channel near Tokio Community, Martin Pena near Highway 22 overpass, and San Juan Bay near constitution Bridge.

A result of this capture is a preliminary list that includes 12 species of fish. Two of them, the Spanish sardine (Sardinella aurita) and the atlantic thread herring (Opisthonema oglinum) are part of the diet of the brown pelican in that area. Both species are commonly found near the mouth the channel. Most of the species found are estuarine species that are highly resistant to changing salinity and eutropich condition. No rare unusual species were found.

3. Geology and soils

Areas along side the Martin Pena Channel and part of San Juan Bay are mainly composed of artificial fill consisting of sand, limestone and volcanic rock, generally less than 5 meters thick. There are scattered patches of swamp deposits consisting of sandy muck and clayey sand generally underlaid by peat formed in mangrove swamps.

Most areas now covered by artificial fill are underlaid by swamp deposits, generally less than 10 meters thick.

South of the channel there are Holocene alluvium deposits of sand, clay and sandy clay with variable thickness (more than 20 meters penetrated in a test well in Rio Piedras Valley near Nemesio Canales). Radiocarbon date of wood found at depth of 15 meters at Plaza Las Americas, 500 east of Nemesio Canales, is about 8,600 years BC.

West and south of this area lay older alluvial Pleistocene and Pliocene deposits composed of silty and sandy clay, mainly red or mottled red and light-gray, with variable thickness, but probably greater than 100 meters in places.

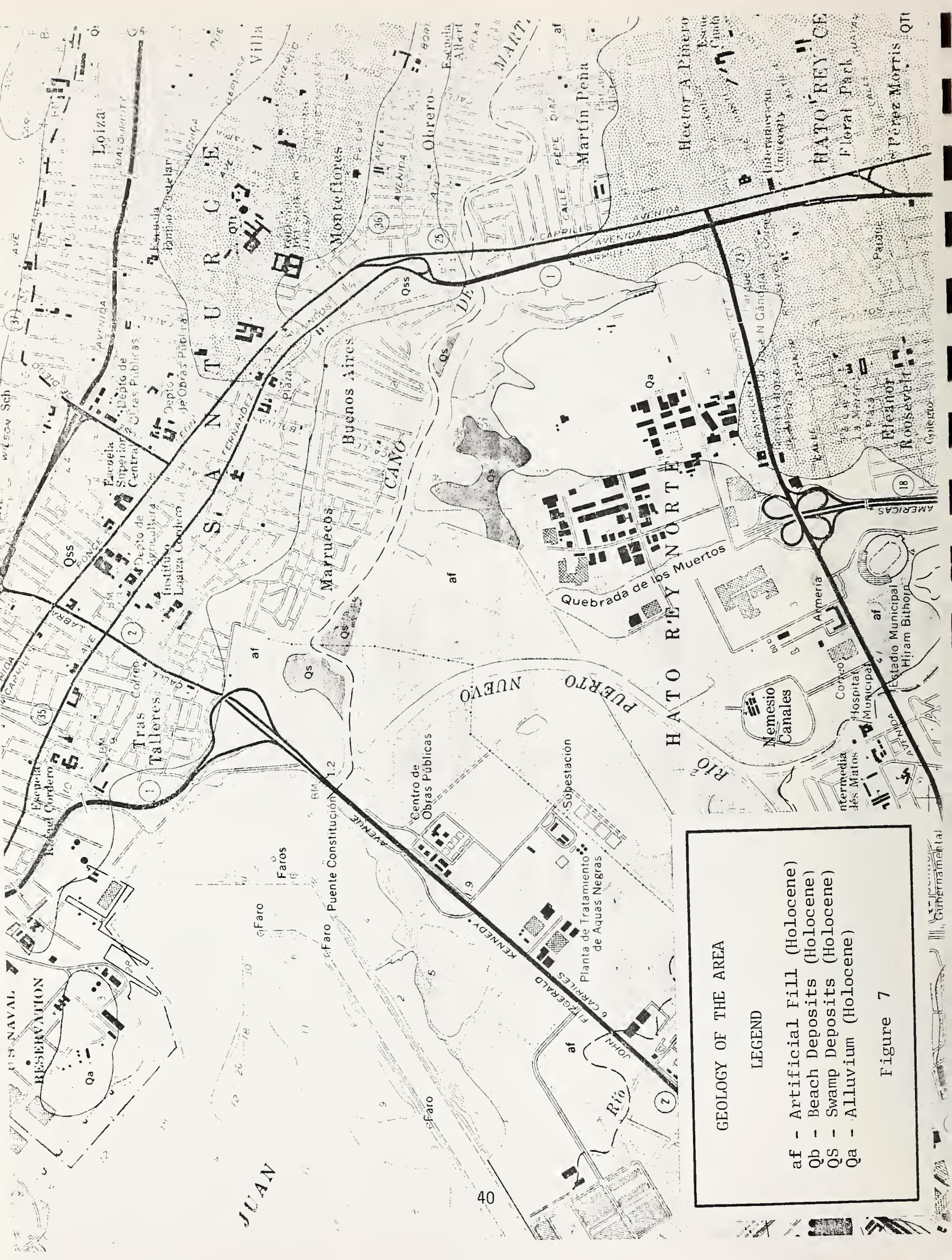
Twenty-one core borings were drilled along the alignment of Martin Pena Channel by the United States Corps of Engineers to gather data for the project (See Appendix C). The borings were drilled to depths of 21 and 40.5 feet below channel bottom. Materials encountered are almost entirely organic silt and clay interlayered with peat. Minor amounts of silty sand are present near the west end of the alignment. The materials are very soft, with very low bearing strength to depth of 25 to 30 feet or more beneath the channel center line. Channel excavation will be in these soft organic materials.

4. Water Resources

a) Surface Waters

The San Juan Metropolitan Area is traversed from South to North by three principal systems of rivers and creeks. Of these; only the Rio Piedras System affects the study area by discharging into the Martin Pena Channel in the vicinity of the Constitution Bridge. The drainage basin of the Rio Piedras covers an area of approximately 26 square miles. The following creeks are tributaries to the Rio Piedras: Margarita, Dona Ana, Josefina, Buena Vista, Guaralcanal, Los Guanos and Las Curias. All the water bodies mentioned above run across developed areas and are channelized to a great extent.

Within the San Juan Metropolitan Area lies the San Juan Lagoon system, a nearly continuous line of marshes, mangrove swamps and lagoons that lie just inland of the northern shore line. It includes the following lagoons: La Torrecilla, Pinones, San Jose, and Condado. All of them are interconnected by channels except for the Condado Lagoon which is connected to the other lagoons through San Juan Bay.



GEOLOGY OF THE AREA

LEGEND

- af - Artificial Fill (Holocene)
- Qb - Beach Deposits (Holocene)
- Qs - Swamp Deposits (Holocene)
- Qa - Alluvium (Holocene)

Figure 7

The Martin Pena Channel is a tidal channel 3.75 miles long on the south boundary of the Santurce section in the municipality of San Juan. It connects San Juan Bay with San Jose and Los Corozos Lagoons which are further connected by the Suarez Canal to the La Torrecilla Lagoon and the Atlantic Ocean. The drainage area of the channel comprises 2,500 acres. Tidal induced flow through the channel is minimal due to the hydraulic regime of the bay-channel-lagoon system. The low velocities in the channel have caused deposition of large amounts of organic materials originating from various sources.

b) Groundwater

The runoff water which infiltrates the volcanic rock formations flows largely through the weathered zone and then into stream valleys. Some groundwater, however, flows through the volcanic rock and may ultimately recharge the tertiary sand and limestone aquifers. The sand and limestone aquifers of the coastal plain are the principal water-bearing formation in the San Juan Metropolitan Area. Recharge of these formations is principally at their outcrops by rainfall and infiltration of steamflow, and discharge is principally into swamps and lagoons along the coastline. Discharge from the confined zones of these aquifers is probably by vertical leakage to the overlying formations. A possible secondary source of recharge to the aquifer in urbanized areas is leaky water and sewer lines.

Rainfall is usually the principal source of aquifer recharge. Even then, a combination of certain conditions must occur before recharge will result. Rainfall must be sufficient to overcome soil moisture demand and yet be of low intensity for maximum infiltration to occur. As these conditions are usually reached only during the rainy season, recharge is cyclic. In the San Juan Metropolitan Area this rainy season occurs between August to November and also in April or May.

Recharge in the San Juan Region is principally derived from rainfall on the outcrop areas of tertiary sand formations, from flow losses from the Rio Piedras in the intake area, and from underflow to the weathered zone in the volcanic rocks of Monte Hualtillo. Recharge to the aquifers of the Metropolitan Area is undoubtedly being reduced by extensive urbanization of the intake areas.

c) Floods

Weather records indicate that only six (6) storms of hurricane intensity have occurred in San Juan during the past seventy years. In studies conducted by the Municipality of San Juan, general guidelines were established for physical development of Martin

Pena Channel. In view of the fact that the Puerto Nuevo River counteracts the normal flow of Martin Pena Channel, a minimum of seven (7) feet above mean sea level has been established for the construction of installations and facilities susceptible to flood damage. These pluvial flood levels were estimated for a fifty (50) year storm.

Figure 8 shows the flood levels for a 100 year storm in the project area. The location of the terminal at Hato Rey is on a zone 2 classification, based on Regulation Number Thirteen (13) of the Puerto Rico Planning Board. This regulation allows the construction of structures in this zone.

5. Water Quality

The bay-channel lagoons system and, in particular, the Martin Pena Channel have been plagued by water quality problems. Structures over the water, wastewater discharges and garbage and debris disposal have reduced the flow section and assimilative capacity of the waterway as well as the tidal flow of water, which in turn have worsened the water quality of the system.

a) Pollution Sources

A large number of wastewater treatment plants discharge their effluents either directly or into the tributaries of the system. However, the direct discharge into San Juan Bay of the Puerto Nuevo Wastewater Treatment plant is the only significant impact from a wastewater treatment plant in the area.

Existing nonsewered areas along both banks of the channel have a significant impact upon its water quality. Waste loads generated in these areas pollute the water bodies by entering storm sewer systems or through overland stormwater runoff.

Stormwater discharges into the bay-channel-lagoon system either overland or through pipes. This runoff contains large amounts of pollutants adversely affecting water quality.

Seepage from the nearby municipal sanitary landfill also has been identified as a possible source of pollution.



LEGEND

- ZONE A - AREA OF 100 YEAR FLOOD
- ZONE C - AREAS OUTSIDE 500 YEAR FLOOD (NO SHADING)

100-YEAR FLOOD BOUNDARY

FIGURE 8

Benthic DO demand due to sludge deposits of organic matter at the bottom of the bay-channel-lagoon system results in a significant removal of oxygen from the water medium.

Presently, there exist four industries which discharge their effluent into the Martin Pena Channel. In addition, a variety of industries discharge their wastes indirectly into the system through connecting creeks and streams.

Algae and other aquatic organisms existing in the bay-channel-lagoon system also are considered sources of pollution. During photosynthesis, they remove carbon dioxide from the water. As a result, pH is raised, making the water alkaline.

Figure 9 shows the location of the different sources of pollution of the bay-channel-lagoon system.

b) Water Quality

(1) Dissolved oxygen (DO)

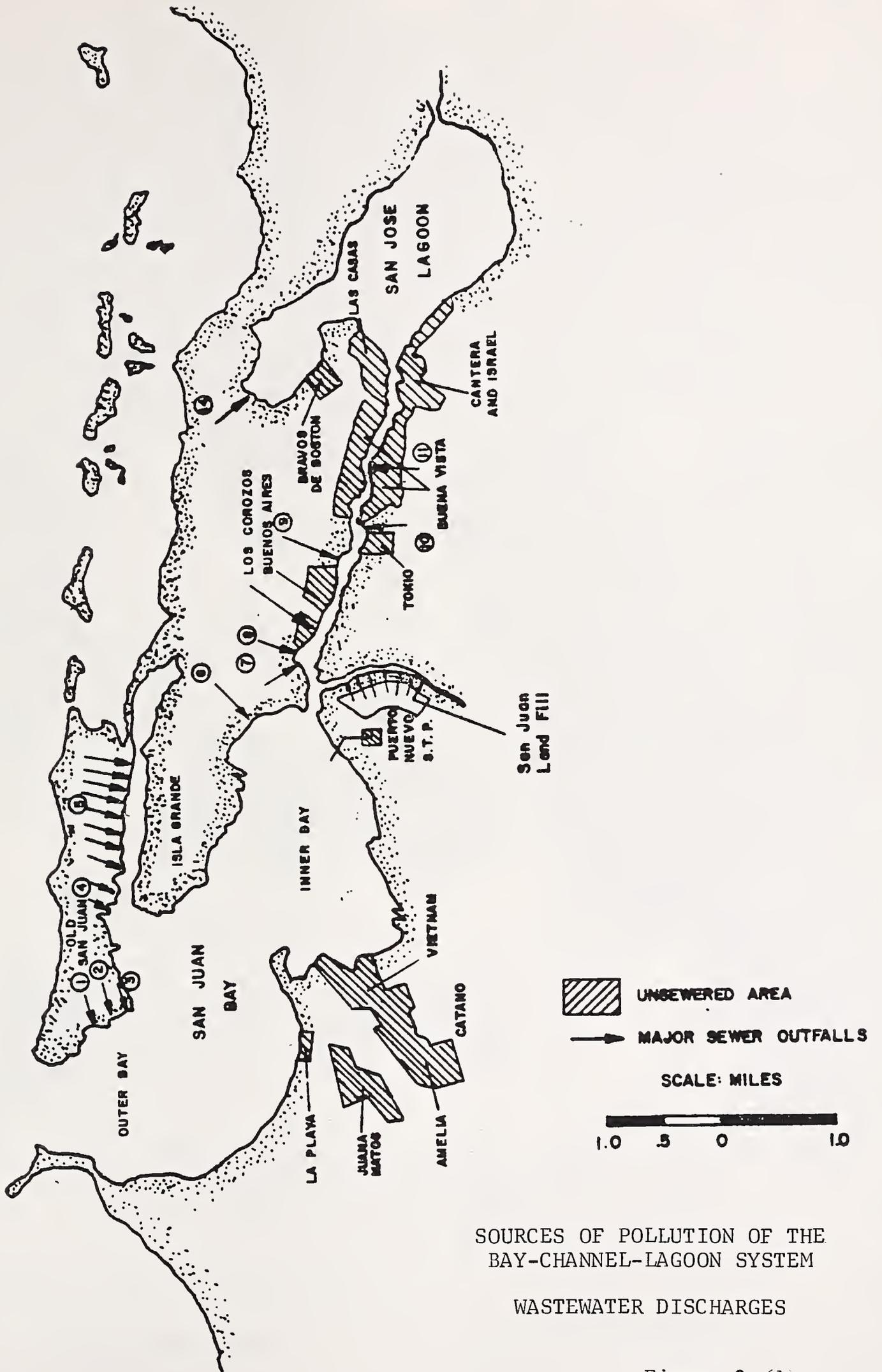
This is one of the most important water quality indicators. It reflects the general level and health of a water body and its capacity to constitute a balanced aquatic habitat. When DO levels are low the propagation of fish or other aquatic life may be impaired and large mortality may occur. The lack of DO, or low levels of it, also creates adverse conditions for aerobic bacteria development and limits the assimilative capacity of the water body.

Experimental data show that DO at Martin Pena Channel does not meet Environmental Quality Board standards.

San Jose Lagoon presently contains sufficient DO to meet EQB standards. This is because the Lagoon is a larger water body than the Martin Pena Channel, providing better dilution and aeration.



ATLANTIC OCEAN



SOURCES OF POLLUTION OF THE BAY-CHANNEL-LAGOON SYSTEM

WASTEWATER DISCHARGES

Figure 9 (A)



LOCATION OF INDUSTRIAL DISCHARGES
Figure 9(B)

In spite of heavy pollutant discharges in the San Juan Bay, the Bay has substantial recuperative capacity. However, it does not comply with the minimum DO requirements stated by EQB.

The main sources of oxygenation are atmospheric re-aeration and algae. The first is mostly a function of water velocity and depth. Where velocities due to tidal fluctuations are low, as in San Juan Harbor or San Jose Lagoon, re-aeration is mostly related to wind velocity and depth of water.

The Martin Pena Channel is located in an area which buffers the wind action. As a result, oxygen transfer to the water is low. Water velocity is the main factor of oxygenation in the absence of wind. Tidal action produces a slow water movement in the channel. This results in a poor capacity of oxygenation from the atmosphere.

The second source of oxygen in the system is the photosynthetic process carried out by algae.

Algae have positive and negative effects upon the quality of the surface waters. The positive effect is the oxygen production by photosynthesis; the negative is the organic matter residue left by dead algae. Decomposition of this residue exerts a significant oxygen demand. Uncontrolled algae growth on the surface may also interfere with oxygen transfer from the atmosphere. Algae also use up some oxygen during respiration. The net result, however, is a very good oxygen production from algae.

The main consumers of DO in the bay-channel-lagoon system are carbonaceous and nitrogenous BOD, benthic oxygen demand, low DO tributaries, aquatic plants, and algae respiration.

(2) Coliforms

Presence of coliform bacteria is an indication that pathogenic organisms may also be present. Coliform counts exceed EQB standards in Martin Pena Channel and in part of San Juan Bay and San Jose Lagoon. Therefore, there is a high probability of the presence of pathogenic microorganisms in the system, creating a health hazard.

(3) pH

EQB standards require a pH between 7.3 to 8.5. Water quality data show that at U.S.G.S. station, in San Jose Lagoon, the pH values are over 8.5. Measurements in San Juan Bay have shown pH values above the limiting 8.5.

pH in Martin Pena Channel is over 8.5 because of the impact of water from San Jose Logoon with high pH. In addition, anaerobic digestion of the benthal deposits existing in the channel produce alkalinity which raises pH, and the dissolved carbon dioxide withdrawn from the water during photosynthesis also raises the pH to some extent.

(4) Nutrients

The two nutrients that could most significantly limit algae growth in the channel are nitrogen and phosphorous. A number of trace elements such as potassium, calcium and magnesium also can inhibit algae growth, but these normally appear in concentrations too low to affect algae growth in natural waters.

The concentration of ammonia nitrogen in the channel encourages the development of algae and other micro and macro-organisms. Phosphorus concentration also is high.

In summary, Martin Pena Channel is rich in nutrients, a potential cause of entrophication. This could become a problem with increases in available dissolved oxygen, as present anaerobic conditions limit algae and aquatic plant development.

6. Coastal Zone

Puerto Rico is an island of limited land resources due to its small size and topography. Limited lowland areas are usually the most productive and appropriate for all kinds of developments. This combination of lowland productivity and development attractiveness of the lowland areas generates land use demands and conflicts.

The continuous growth of the San Juan Metropolitan Area generates an increasing demand for the development of the lowlands surrounding the area. Unless carefully managed, the probable increase of population density and concentration of economic activities will bring adverse affects to the quality of the environment and general characteristics of the area.

With the purpose of solving these conflicts and problems, a Coastal Zone Management Plan of Puerto Rico has been prepared. Its goals are to insure the best use of land and coastal resources. The objective is to maximize the economic development of Puerto Rico in a way that is compatible with environmental conservation and protection of coastal zone resources.

The Management Program Plan incorporates the coastal zone inland from the shoreline to the extent necessary to control shorelands. Emphasis is placed on uses that have a direct and significant impact on coastal waters. The coastal zone of the Commonwealth of Puerto Rico

includes a strip extending one (1) kilometer inland from the shoreline and extending additional distances inland where necessary to assure the inclusion of key natural systems of the coast. Section 304(a) of the Coastal Zone Management Act of 1972 specifies that the coastal zones include islands, transitional and intertidal areas, salt marshes wetlands and beaches.

The Constitution Bridge mudflats and the wetlands system in the area are included in this Management Plan. The mudflats are one of the best available areas for shorebirds, gulls and terns. On a per acre basis, these flats support the greatest diversity and concentration of birds in the San Juan urban area. Two endangered species, the Brown Pelican and the Yellow-shouldered Blackbird use them, but they are more concentrated on the mangrove peninsula at the mouth of the channel. These mudflats are declared a natural reserve in the Management Plan.

B. MAN-MADE ENVIRONMENT

1. Socio-Economic

a) General

In the last four decades Puerto Rico has experienced an economic redevelopment, shifting away from agriculture to industry. In this shift, the San Juan Metropolitan Area has shown notable growth. This is due mainly to a constant migration of people from rural areas to San Juan looking for better job opportunities in non agricultural jobs. Also, there has been a rise in the number of immigrants from different parts of Latin America, mainly Cuba and the Dominican Republic.

According to the 1980 Census, the Metropolitan Area of San Juan comprises an area of 250,634 acres, with a population of 1,175,451. The San Juan Metropolitan Area covers 11% of the total area of the Island and 37% of its population.

Old San Juan and Hato Rey are the most important commercial districts of the city. These are connected by the Martin Pena Canal and San Juan Bay. The bay also connects Old San Juan with Catano.

The existing highways between these districts are Ponce de Leon and Fernandez Juncos Avenues and the Munoz Rivera Expressway.

Old San Juan is considered the second oldest city in America. As such, it is a tourist attraction. For many years it served as the city center, with a large range of services and facilities including residential, commercial, offices, financial and cultural. As commercial and governmental activities shift with population growth away from Old San Juan, its importance as a functional center is declining.

Nevertheless, it still is a center of multiple uses, consisting principally of tourist and commercial activities.

The area of the proposed project in Hato Rey also is to be multiple use, including residential commercial, financial, recreational, educational and industrial (see Figure 10). Contrasting with the modern development in the area is one of the largest slums in San Juan, Barrio Tokio.

The financial center, currently a concentration of high rise offices, is expanding rapidly into the vacant land between it and the Plaza Las Americas Shopping Mall, which is the largest shopping center in Latin America. Between the Financial District and Plaza Las Americas are hundreds of acres of vacant and recently developed land under control of New Center for San Juan Corporation, a public agency specifically empowered to develop this area as the new functional center of the city. Under construction or planned for this area are numerous major office buildings as well as residential and institutional centers. The New Center eventually will contain over 7,000,000 square feet of office space and 5,000 housing units in addition to institutional and recreational facilities. An industrial park is located between that area and Plaza Las Americas. The Tres Monjitas Industrial Park consists of 69 lots of 4,000 square feet each. Across the street from Plaza Las Americas is San Juan's Major Sports Complex consisting of three major facilities, including a stadium, an indoor coliseum and a gymnasium.

b) The New Center of San Juan

In 1966, a plan for development of a new city center was prepared based on several studies that concluded Old San Juan could not continue as the City's functional center.

The planning objective was the shaping of an active multi-use urban activity hub with a wide range of services and facilities to support those activities. The New Center is to be a government, commercial, financial, cultural, educational and recreational center, as well as a dwelling site. In its residential aspect, the New Center will be an urban prototype of good living, providing accommodations for people of all economic levels.



EXPRESSWAY

VILLAS DEL PARQUE AND
LILIAN APARTMENTS RESIDENTIAL
DEVELOPMENTS (FORMER SUN AREA)

PARQUE CENTRAL (SPORTS CENTER)



PENONZA RIVERA EXPRESSWAY
SAN JUAN APARTMENTS RESIDENTIAL DEVELOPMENTS (LUMBER SLASH AREA)

HATO REY CENTRO AND PARQUE CENTRO RESIDENTIAL DEVELOPMENTS

COMMUNITY COLLEGE OF SAN JUAN

BARRIO TOKIO

VACANT LAND (SCS.I)

TRES MONJITAS INDUSTRIAL PARK

TRES MONJITAS INDUSTRIAL PARK

PLAZA LAS AMERICAS SHOPPING CENTER

ENRIQUE VILLAS PUBLIC HOUSING DEVELOPMENT

PARQUE CENTRAL (SPORTS CENTER)

LAND USES IN THE PROJECT AREA
FIGURE 10



MINOZ RIVERA AVENUE

BARRIO TOKIO

VACANT LAND (C.S.J)

LAND USES IN THE
PROJECT AREA
FIGURE 10

In 1968, 154 acres of land in the project area were acquired by the P.R. Land Administration for the development of the NCSJ. Since the opening of the First National City Bank Building to the completion of the Banco de Ponce Building in 1973, eight office buildings were constructed during this period, with approximately 2.5 million square feet of rentable space. Then came the economic crisis paralyzing all the construction activity in the New Center. It was not until 1976, with the construction of the Federal Office Building and Courthouse, that development started on government owned land. Shortly afterwards came the first residential project of the New Center, Torre de San Juan, a 196 unit rental apartment project under HUD's Section 8 program.

The Municipality of San Juan has completed two additional projects: a 15 story office building and the Community Technological College. The Public Building Authority also built two projects: the Lottery Building complex and the Free School of Music. The Commonwealth Auto Accident Compensation Agency (ACAA) Building is now under construction and construction is about to begin on the New General Public Library of Puerto Rico.

A grant in the amount of \$3.5 million was awarded under the Urban Development Action Program (UDAG) of HUD. With these funds the following infrastructure was built: a segment of Arterial "B" and Hostos Avenue, and the first phase of the public utilities consisting of a sanitary sewer, a storm sewer and a water system plus an electrical and telephone distribution system. With these utilities and with the construction of the \$1.5 million Tres Monjitas storm drainage channel, built by the Municipality with the help of the Economic Development Administration (EDA), the construction of the following projects was possible: Hato Rey Centro and Parquecentro (112 and 226 walk-up apartments sold as condominiums under the provision of Law 10 mortgage subsidy program) and Egida Colegio de Abogados (100 apartments for the elderly under HUD's Section 202). Under construction are two projects, La Morada consisting of 178 apartments under HUD's Section 8 Program and Jardines de Cuenca, 164 walk-up units under HUD's Section 235 Mortgage subsidy program. These 342 units will raise the total residential units in the New Center to approximately 1,000 units.

In the Financial district the \$17 million Scotia Bank Office Tower is under construction; representing the first new major office building since 1973. In the last five years around \$75 million in public and private funds have been invested in the New Center.

c. Tokio Community

Adjacent to the Hato Rey Financial Center is Barrio Tokio, a slum area with a high concentration of dilapidated and deteriorated structures. It covers an area of approximately 67,993.22 square meters (17 acres), and is bounded by Martin Pena Canal on the north, Ochoa Canal on east, and P.R. Land Administration (NCSJ) on the south and west. The owner of the land, which was illegally occupied by the residents about thirty (30) years ago, is the Government of Puerto Rico.

The quality of life in the community is typical of a slum. The dwelling units are of wood with galvanized iron-zinc roofs. Most of them are highly deteriorated. The community suffers lack of adequate infrastructure. Water and electricity services are provided. However, no sewer system exists. Sewage and solid wastes are discharged into Martin Pena and Ochoa Canal, affecting the water quality and aesthetics and causing strong unpleasant odors. Sales in the neighborhood are not recorded in the Property Registry and no financial sources are available for the construction or improvement of structures.

The community includes 528 houses, 43 businesses, 3 non-profit organizations (churches) and one elementary school. Of the 528 houses, 480 are occupied by 490 families while 48 are vacant, for a total population of 1,469 inhabitants. Of the 490 families, 67 are tenants. The School age population totals 448 while 213 children are of pre-school age (under 5 years old). The elderly represent 7.97% or 116 persons.

The average family income in the community is \$411.00 per month, for an annual average income of \$4,923.

Table 11.A presents the household distribution by income source in the community. Table 11.B presents information about the businesses operating within the community.

Table 11.A

Household Distribution by Income Source in Tokio Community

<u>Source</u>	<u>Households</u>	<u>Percent of the total</u>
1. Gainfully employed	210	42.8
2. Food Stamps	167	34.0
3. Social Security	80	16.4
4. Unemployed	16	3.3
5. Other (child support, veterans retirement, scholarship)	17	3.5

TABLE 11. B

COMMERCIAL ESTABLISHMENTS AT
TOKIO COMMUNITY

BLOCK	BUSINESS ADMINISTRATOR	ADDRESS	TYPE OF BUSINESS
1. A-20 N	Carmen Cruz	C/ 3 #137 Tokio	Fruturas y Miscelaneas
2. A-21 BN	Juan R. Pumarejo	C/ 3 #61 Tokio	Refrigeración (Bajos)
3. A-23	Efren Molina	C/ 1 #41 Tokio	Mecánica
4. A-25 BN	Marcos Martínez	C/ 1 #37 Tokio	Bebidas y Miscelaneas
5. A-31 N	José Cortés	C/ 1 #27 Tokio	Miscelaneas
6. A-33 BN	David Alamo	C/ 1 #25 Tokio	Venta de Ropa
7. A-37 BN	Juan Navarro	C/ 1 #21 Tokio	Miscelaneas (Bajos)
8. A-49 B	Andrés Casanova	C/ 4 #183 Tokio	Almacén Botella
9. B-2 N	Mercedes Hernández	C/ 3 #156 Tokio	Colado Cafetería
10. B-6 BN	María Delgado Casado	C/ 3 #148 Tokio	Almacén latas y botellas
11. B-25 BN	Juan Hernández	C/ 3 #132 Tokio	Colado Hernández
12. B-28 N	Jimmy Soto González	C/ 3 #130 Tokio.	Jimmy's Place
13. B-33 N	José A. Pabón	C/ 3 #126 Tokio	Toni's Place
14. B-53 BN	Carmen A. Casanova	C/ 2 #123 Tokio	Limber, Cartón, botellas
15. B-69 N	Esteban Montes Pérez	C/ 2 #109 Tokio	"El Algarrobo"
16. B-77 BN	José A. Lamboy	C/ 2 #95 Tokio	Negocio
17. B-78 N	Juan de Dios Soto	C/ 1 Final Esq. 2 Tokio	Cafetin- Bar
18. C-5	Manuel Ranjel	C/ 1 #15 Int. Tokio	Negocio Limber
19. C-11 BN	Eduardo Cruz	C/ 1 #16 Tokio	Colado La Placita
20. C-14 BN	Ismael Cruz Durecut	C/ 1 #16 Int. Tokio	Barterfa
21. C-26 N	Carmen M. Rodríguez	C/ 1 #24 Tokio	Gomas

Revised 3/25/83

Prepared by Housing and Community Development Office of the Municipality of San Juan

TABLE 11.B (Cont.)
 COMMERCIAL ESTABLISHMENTS AT
 TOKIO COMMUNITY

<u>BLACK</u>	<u>BUSINESS ADMINISTRATOR</u>	<u>ADDRESS</u>	<u>TYPE OF BUSINESS</u>
22. C-28 BN	Lino Rivera de Jesús	C/ 1 #26 Tokio	Colmado Rivera
23. C-31 BN	Emma Reyes Mañero	C/ 1 #28 Tokio	Barzar Tokio
24. C-41 N	Ramón Santiago	C/ 1 #42 Tokio	Cinchorrito
25. C-44 N	Roberto Cruz Sánchez	C/ 1 #46 Int. Tokio	Mecánica (Motora)
26. C-57 BN	Ricardo Conde	C/ 1 #56 Tokio	Colmado López
27. C-57 BN	Ricardo Conde	C/ 1 #56 Tokio	Mecánica
28. C-53 N	Luis A. González	C/ 1 #62 Tokio	Artesanía
29. C-70 BN	Leonardo Maldonado	C/ 1 #60 Int. Tokio	Hojalatería
30. C-71 BN	Jesús Pérez Ortiz	C/ 1 #60 Int. Tokio	Hojalatería
31. C-100 N	Isafas Pérez Ortiz	C/ 1 #36 Tokio	Callar de Muebles
32. C-101 B	Roberto Delgado Gómez	C/ 1 #71 Tokio	Callar de Mecánica
33. D-24 N	Ernesto Pérez Miranda	C/ 1 #71 Tokio	Barbería al lado y Miscelaneas
34. D-28 BN	Fulgencio Vega	C/ 1 #79 Tokio	Bar
35. D-29 BN	José Rosado Rivera	C/ 1 #92 Tokio	Mecánica
36. D-30 BN	Eladio Rodríguez	C/ 2 #110 Tokio	Las 3 TTT
37. D-41 N	Genoveva Román	C/ 2 #110 Tokio	Colmadito
38. D-43 BN	Manuel Yambo López	C/ 2 #114 Tokio	Bebidas
39. D-49 BN	Aurelia Concepción	C/ 2 #118 Tokio	Colmado
40. E-15	Victor Morales	C/ 1 #13 Tokio	Mecánica
41. T-2 BN	Ismael López Ramos	C/ 1 #60 Int. Tokio	Hojalatería
42. T-28 BN	Miguel Rodríguez	C/ 1 #80 Final Tokio	Colmado
43. T-97 N	Torbio Roldán	C/ 1 #87 Tokio	Negocio Frituras

Revised 3/25/83

d) Land Use Plan for the Martin Pena Canal

One decade ago, the shores of the Martin Pena Canal were almost totally occupied by slums. Conscious of the situation, the municipality of San Juan initiated a urban renewal policy for those slum areas alongside the channel. A former slum in Buenos Aires sector, south of Munoz Rivera Avenue and north of the channel, already has been removed. In its place, two multifamily housing projects were built: San Juan Park and Villas del Parque. San Juan Park consists of 250 walk-up apartments under Section 8 and villas del Parque consists of 235 walk-up apartments under Law 10. Parque Central and Parque Ecuestre are recreational centers which have also been constructed as part of this municipality program. Both are located on the northern shore, in the western section of the channel. Meanwhile, a formal Land Use Plan for the Martin Pena Canal was prepared and approved.

The plan contemplates the conversion of the slum areas along the channel into one of the largest recreational areas of Puerto Rico for active and passive recreation, including amusement parks with playgrounds for children, for residents of the SJMA and its visitors. The plan includes the construction of coffee shops, candy stores, magazine stands, ice cream parlors and fast food stores.

Barrio Tokio is the last squatter community in this sector of the canal which is to be relocated under the Plan.

2) Aesthetics

The aesthetic quality of the environment in the area may be described in two contexts:

- (1) Visual quality of the natural or man-made environment as seen either from the channel or from land, and
- (2) The aesthetic quality of the environment of the Martin Pena Channel, as a function of water quality.

The natural features of the project area constitute a unique and special place with high visual and aesthetic values. The mangrove and marsh zone environment, together with the fauna, contribute to the natural beauty of the area, which has the potential of being developed as an important outdoor recreational facility.

A person passing through the Martin Pena Channel will experience diverse sensations along the route. Starting at the entrance of the channel from the Bay of San Juan, the viewer sometimes has the opportunity to observe the mudflats, areas of extremely shallow water where the mud is exposed

during low tide. These areas of fine sediment accumulation are generally regarded as unappealing and unaesthetic, but are used for resting by local and migratory birds. During high high tide the mudflats are covered and these areas cannot be easily distinguished. Throughout the area, flocks of continuously flying birds can be seen.

In the interior part of the channel, the viewer is surrounded on both sides by a high and densely packed community of mangroves, red mangrove being the most abundant at the edge of the channel. The green area is contrasted by the dark grayish color of the water in the area. Water transparency is near zero and fish species are few. Birds are the most diverse and abundant group of land and aquatic animals that can be seen. Some banks of sediment deposits can be found in the channel due to the scouring and deposition experienced over the years.

Traveling further east, the viewer will reach the Martin Pena Bridge and the Tokio community. This area presents a very deteriorated scene. Water is heavily polluted, and the area has been utilized as a dumping site by the residents, causing strong unpleasant odors. The substandard residential structures built of wood and zinc create a very unpleasant view, not only from the channel, but also from Munoz Rivera Avenue and the high rises at the Hato Rey Financial Center.

3) Noise

No sensitive noise receptors are located alongside the water section of proposed project and the ferry vessels will not be a significant noise generator. Therefore, only the busway section needs to be evaluated from the point of view of noise.

Highway traffic has been identified as the major source in the San Juan Metropolitan Area. Considering that the area of the New Center of San Juan is still under development, including the streets system, the area is comparatively quiet.

Calibrated noise meters were used for measurement of the existing noise levels at selected receptors in the area (see Figure 11). The results of these measurements are shown in Table 13. The noise levels found at receptors 1 through 4 were produced primarily by construction activities, aircraft and parking circulation. Only at receptor 5, located close to Chardon Street is traffic the dominate noise source. This receptor is representative of every receptor along the street, which are primarily businesses and offices. The

existing noise levels found at every receptor are below the design noise levels established by the Federal Highway Administration of 67 dBA (Leq) for residential use and 72 dBA (Leq) for commercial use (see Table 12).

4) Air Quality

The more significant pollutants from transportation sources are carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NOx), especially the former. By far the greatest transportation contributor is the motor vehicle, accounting for over 60 percent of the total pollutant burden. Clean Air for Puerto Rico, prepared by the Environmental Quality Board (EQB) in 1978, indicated that automotive emissions of CO, HC and NOx account for 81, 70 and 61 percent, respectively, of the total emissions of these pollutants. For this reason, the highest CO concentrations in the San Juan Metropolitan Area have been measured by the Puerto Rico Highway Authority at sites close to highly transited highway intersections. Even at those sites, the CO concentrations found are under the one and eight hour standards promulgated by the Environmental Protection Agency (EPA), 35 PPM and 9 PPM, respectively. The highest concentration in the area was 28.3 PPM at Baldorioty de Castro Avenue.

Only the land phase of the project needs to be considered for air quality analysis, due to the absence of sensitive receptors along the waterway and the insignificant amount of emissions expected from the ferry vessels. Along the busway corridor, only within the New Center of San Juan area are residential and educational developments found which might be considered sensitive to air pollution. Due to the fact that the area is still under development, including the infrastructure, no major transportation routes exist in the area, except Chardon Street. Considering the low CO concentrations found at the sites of the worst traffic conditions, and the absence of any other CO emissions source nearby, it can be affirmed that the existing CO concentrations in the entire project area are well within applicable standards.

During recent years, the area of the New Center has been subjected to intense construction activity. Such activity has contributed to the air pollution of the area, primarily due to the airborne particulate resulting from wind erosion during earthwork activities, and exhaust gases from construction equipment. However, this pollution has been temporary and localized to the immediate area around the construction site. In addition, few sensitive receptors have existed near those construction sites.

CHAPTER IV

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

A. REGIONAL AND COMMUNITY GROWTH

1. Compatibility with Comprehensive Urban and Regional Development Plans

A revised Land Use Plan for the San Juan Metropolitan Area was prepared by the Planning Board of Puerto Rico and approved by the Governor of Puerto Rico in 1982. The project area is included in that comprehensive plan. This plan is consistent with more specific plans developed for the area by the Municipality of San Juan in cooperation with appropriate state agencies. These Municipality of San Juan developed plans are:

- 1) Plan for the Development of the New Center of San Juan; and
- 2) Land Use Plan for Martin Pena Channel.

New Center of San Juan Development Plan

More information about this plan is contained in Section III-B.1 and Technical Report E, "Plan for the Development of the New Center of San Juan.

The proposed action is not only compatible with the New Center of San Juan Development Plan but will also serve as a catalyst in achieving its goals. Any land development plan is shaped by its transportation system, one of the most important infrastructural elements.

The ferry service will provide a fast, safe and direct connection from Old San Juan to the New Center where the intermodal terminal will be within easy walking distance from numerous proposed and constructed major activity centers.

The bus feeder will provide fast, safe and direct access from the New Center of San Juan to Plaza Las Americas Shopping Center, the Bithorn/Clemente Sports Complex and the intermodal terminal. In addition, it will provide for local circulation within the core area. The existing residential developments in the area are government subsidized and are being occupied by low to medium income families, who tend to be more dependent on the public mass transportation system. Additional residential developments in the area are also assured to be subsidized.

Depending on the busway alternative finally selected, several segments of the proposed street system for the New Center of San Juan, such as Arterial B and D will be constructed, increasing the attractiveness of the area for additional development. Nevertheless, those alternatives which propose busway operation on exclusive lanes on these streets will lessen their capacity for carrying private automobiles.

Land Use Plan for Martin Pena Canal

Information about this plan is included in Section III-B.1.

The planning objective of the Land Use Plan for Martin Pena Channel is the improvement of the water quality and the quality of human life along the existing channel by eliminating the slum areas and relocating the families to decent, safe and sanitary dwelling units. These areas will be redeveloped for recreational purposes.

The proposed action reinforces the objectives of this plan by not only providing better access for the proposed recreational facilities but also improving the channel for recreational purposes.

The proposed developments including the proposed theme park along the western section of the canal, could be served by the ferry system should intermediate terminals be provided in the future.

2. Compatibility with Comprehensive Transportation Plans for the Development of the Region

Based on the planned future land uses, and after a comprehensive transportation study, a Transportation Plan for the San Juan Metropolitan Area was approved in 1968. Even though the planned land uses did not experience significant changes during the revision of the Land Use Plan of 1982, the Transportation Plan was significantly modified to reflect the financial limitations of the Department of Transportation and Public Works, the Highway Authority and the Metropolitan Bus Authority of Puerto Rico.

The proposed ferry and bus service has not been included in the Transportation Plan for the San Juan Metropolitan Area. Since the project will serve to alleviate future congestion which will result because of the reduction in planned facilities, it is compatible with the plan.

B. SOCIO-ECONOMIC

1. Land Acquisition

Privately owned commercial land acquisition is required for the construction of the proposed busway. Fair market compensation will be paid to the owners of the those lands. The land acquisition costs range from \$1,722,500 to \$3,252,500, depending upon the alternative to be selected (see Section II.B.2).

Private land acquisition might be necessary for the intermodal terminal, depending upon the location alternative to be selected.

2. Displacement of Families, Businesses and Non-Profit Organizations

The relocation of Barrio Tokio as well as other squatter slum settlements along the banks of the Martin Pena Channel has helped part of the City of San Juan's plans for providing decent, safe and sanitary housing for all of its residents. When the Draft Environmental Impact Statement was prepared it was assumed that the relocation of Barrio Tokio was to be performed by the City of San Juan using HUD money. To that end the City of San Juan has prepared a relocation plan and a Finding of No Significant Impact (FONSI) which was advertized on October 6, 1982. The relocation of Barrio Tokio has now been included in the Agua-Guagua project and therefore is included in this document. The relocation plan has been approved by UMTA.

Part of Barrio Tokio is affected directly by the proposed project due to the widening of the Ochoa Canal and construction of the intermodal terminal, including a parking area. However, a decision has been taken to displace totally the community for reasons of access loss and aesthetics in the terminal area. The taking of the whole slum is compatible with the policy of urban renovation, as established in the Land Use Plan for the Martin Pena Canal.

The City's Housing Department conducted a socio-economic study of the Barrio in order to determine the social and economic conditions, relocation possibilities and willingness of people to move. The information was collected in a house to house survey. A socio-economic profile of the community is included in Section III.B.1.C.

The Tokio neighborhood survey revealed that 528 structures will be affected with an estimated value of approximately \$5,500 each. Of the 528 structures, 480 are occupied and 48 vacant. Distribution by tenure type is as follows: 410 owner occupants and 67 tenants. There are 43 businesses or commercial establishments mostly owner operated concerns. (See Table 11.B for details). In addition, there are 3 non-profit organizations in the area, which operate as religious institutions, and an elementary public school. Since most of the students are of the Barrio to be displaced, the Department of Education is planning to close the school. The rest of the students (about 10%) will be transferred to other schools available nearby.

The displacement of the community can not be considered a negative impact. On the contrary, the community disruption, and other inconveniences of moving will be more than compensated by providing them with decent, safe and sanitary housing facilities. The community is planned to be displaced as part of the Land Use Plan for the Martin Pena Canal.

The new developments around the community seem to strangle it. The residents do not feel they are part of the progress. Therefore, the news about the relocation plan for the area was eagerly received by the affected people. It will bring them the opportunity of a new life, a new start in a place of their own selection. This positive attitude of the residents toward the project was expressed in field interviews, written requests petitioning their immediate relocation, and in several public forums sponsored by the Municipality of San Juan.

Of the 490 households affected, 480 will actually be entitled to relocation assistance under the Uniform Relocation Act. The remaining families consist of married couples residing with their parents until they can support themselves. The 43 businesses and 3 non-profit organizations also are eligible for relocation assistance under the Act.

Replacement Housing Payments

A displaced family or individual will receive payment of properly acquisition purposes at fair market value. If it is not enough for the acquisition of a decent, safe and sanitary replacement house, the family or individual will be entitled to receive an additional amount of no more than \$15,000. This payment may include:

- the difference between the price paid for the property formerly occupied and the cost of a comparable replacement dwelling.
- an amount to compensate for any increased interest costs for a new mortgage.
- certain closing costs on the replacement dwelling.

If the acquisition price plus \$15,000 is not enough to provide a decent, safe and sanitary unit, last resort housing is available. Under last resort, the family will receive a payment large enough for the acquisition of a replacement dwelling of such characteristics.

For the determination of the value of the house to be displaced, property valuations will be performed prior to the initiation of negotiations. As required by UMTA regulations, two appraisals will be made for every property subject to acquisition. A rough estimate of \$5,500 average value per structure has been made. Thus, 528 structures will be acquired at an approximate total cost of \$2,904,000 (see Table 11.C).

If the \$5,500 average property value is added to the \$15,000, families will have approximately \$20,500 for property acquisition purposes.

A tenant family or individual will be eligible to receive rental replacement housing payment not to exceed \$4,000 distributed throughout a period not to exceed four years. A total amount of \$268,000 has been estimated for this item.

Moving and Related Expenses

All displaced individuals, families, businesses or non-profit organizations are eligible for payments for moving and related expenses without regard to the length of time that the occupant inhabited the property from which displacement occurred.

The displaced families or businesses will have the option of payments on the basis of actual reasonable moving expenses or a moving expense schedule:

1. A displaced individual or family who elects to receive fixed dislocation and moving expense allowances in lieu of payment of actual moving expenses will be entitled to a dislocation allowance of \$200 and an allowance for moving expenses of not more than \$300.
2. The owner of a displaced business will be entitled to receive a payment for actual reasonable moving expenses or a fixed payment of not less than \$2,500 nor more than \$10,000.
3. Payment to non-profit institutions is limited to \$2,500.

The estimated total acquisition and relocation cost for Barrio Tokio is \$11,001,425 (see Table 11.C).

Relocation Possibilities

Most of the businesses established in Barrio Tokio are small, resident owner operated concerns. The study undertaken indicates that most owner/operators are not planning to reestablish their businesses. However, should any proprietor be interested in continuing operations at another location, technical assistance, counseling and other necessary services to relocate such businesses will be provided. Coordination with the San Juan Community Development Corporation, the Small Business Administration and other concerned agencies will be of benefit during the process in order to guarantee the maximum possible assistance.

Table 11(C) ESTIMATE OF RELOCATION COSTS - BARRIO TOKIO

A. PAYMENTS TO FAMILIES AND INDIVIDUALS

<u>Type of Payment</u>	<u>FAMILIES</u>		<u>INDIVIDUALS</u>		<u>TOTAL</u>	
	<u>NO.</u>	<u>AMOUNT</u>	<u>NO.</u>	<u>AMOUNT</u>	<u>NO.</u>	<u>AMOUNT</u>
Moving Expenses					477	\$ 238,500
1. Maximum Fixed Payment and Dislocation Allowance			410	6,150,000		
Replacement Housing Payments Homeowners			67	268,000		
Replacement Housing Payments Tenant Occupants					477	\$ 6,656,500
<u>TOTAL.</u>						

B. PAYMENTS TO BUSINESS CONCERNS AND NON PROFIT ORGANIZATIONS

<u>Type of Payment</u>	<u>BUSINESSES</u>		<u>NON PROFIT ORGANIZATIONS</u>		<u>TOTAL</u>	
	<u>NO.</u>	<u>AMOUNT</u>	<u>NO.</u>	<u>AMOUNT</u>	<u>NO.</u>	<u>AMOUNT</u>
Payments in Lieu of moving and Related Expenses	43	\$ 430,000	3	\$ 7,500	46	\$ 437,500

C. ASSISTANCE COSTS

Estimate of all relocation costs, other than the payments enumerated above, to be included in computing the amount of the Federal Grant.

\$1,003,425

D. ESTIMATE OF RELOCATION COSTS

\$8,097,425

E. ESTIMATE OF ACQUISITION COSTS 528 structures at \$ 5,500 average estimated value

2,904,000

F. ESTIMATE TOTAL FOR PROJECT

\$ 11,001,425

Other city relocation plans will affect a minimal number of small business concerns and should not provoke excess demand for available commercial space.

The municipality of San Juan is carrying out other housing relocation activities. However, the city is currently promoting, in coordination with the Federal Government, the Commonwealth Government and private enterprises, the construction of low and moderate income housing. In the Buenos Aires Sector, for example, approximately 250 housing units have recently been constructed and 210 additional units will be constructed by Fiscal Year 1984. In the New Center of San Juan there are approximately 342 housing units under construction which will be available during 1983 and 1984. Additional units are planned for construction soon in the NCSJ. All these developments present the advantage that they are located very close to the Barrio making the maintenance of existing ties with nearby areas possible. A preference for single family units was expressed during the survey, while the new developments are walk-up apartments.

Table 11.D presents a preliminary listing of a low priced housing available for sale. Given the limited economic capacity of the displaced families, a selection has been made of available housing from Veterans Administration, the Housing and Urban Development Department, selected realtors, and local public low cost and subsidized programs.

No problems are foreseen for the families relocation since many of them have already selected alternatives to be discussed with the relocation officials.

Public Participation and Advisory Services

A scoping meeting opened to the public was held for the proposed project on September 16, 1982. Another public hearing was held on June 20, 1983 on the DEIS. The residents of Barrio Tokio were especially invited to attend and participate. Some of them attended. Nobody was opposed to the displacement of the community.

Furthermore, in order to insure the maximum assistance to relocated families, a relocation assistance advisory program will be developed.

TABLE 11.D (Cont.)

Low and Moderate Income Housing
Available for sale Distributed
by Location, Number of Bedrooms
and Cost Per Unit

PROJECT NAME AND LOCATION	2 Bedroom's		3 Bedroom's		4 Bedroom's		5 or more	
	NO.	COST	NO.	COST	NO.	COST	NO.	COST
III. Realtors Listings								
- San José, Río Piedras			1	\$40,000			1	\$25,000
			1	\$30,000				
			1	\$37,000				
- Rivas de Cupey, Río Piedras			1	\$35,000			1	\$15,000
- Parcelas Falú, Río Piedras			1	\$36 000				
- Vista Mar Marina B.O.			1	\$18,000				
- Sierra Maestra, Hato Rey			1	\$25,000				
- Villa Kennedy, Santurce			1	\$33,000				
- Calle Loiza, Santurce			1	\$25,000				
			<hr/>				<hr/>	
			9				2	
IV. Low Cost Housing								
- Venus Gardens, Cupey, R.P.			99					
- Villa Panamericana, Río Piedras			266					
			<hr/>					
			365					
V. Section 235 (Interest Subsidy)								
- Villas del Parque, Santurce	56	\$45,000	80	\$49,500				
- Jardines de Cuenca, Hato Rey	52	\$49,569	112	\$52,950				
			<hr/>					
			108		192			
			<hr/>					
TOTAL HOUSING AVAILABLE FOR SALE	123		604			18		5

Designated officials will take necessary actions to advise displaced persons and businesses about their rights, eligibility requirements and relocation payments; supply information on available federal and state housing assistance; aid the displaced persons and businesses in completing required application for relocation benefits; provide information on available housing and commercial facilities; maintain and make available any information that may prove to be of value in selecting comparable dwellings in selecting new business locations, and in general, provide any assistance or information that contribute to the timely, orderly and efficient execution of the relocation program.

Upon receiving official notice of funding approval, an immediate notification will be made, by certified mail or, if necessary, through personal contact to the affected families and businesses, of the intention to acquire their properties. Steps will be taken to publish notices, organize meetings, conduct personal interviews and provide information as to displacement, relocation services, property valuation procedures, relocation payments, right to appeal, etc.

3. Community Cohesion

The only negative impact of the project in terms of community cohesion is the disruption of Tokio Community. Most of the residents of Barrio Tokio have been living there for thirty years. This is long enough as to create strong friendship and family ties. However, as previously discussed, those residents will be benefited from an improvement in their life quality, which more than compensates for the adverse social impact. Moreover, the community has been proposed for displacement under the Land Use Plan for the Martin Pena Canal for some time and therefore, the residents have become psychologically prepared for the move.

On the other hand, as any transportation project, the proposed action will improve the ties between some communities. The ferry system will unify the community of the NCSJ with Old San Juan and Catano.

4. Recreation

The proposed project will have a significant positive impact on recreation.

Old San Juan is one of the most important centers of passive recreation in the SJMA. It is highly visited, primarily during weekends and holidays. The traffic congestion on the access roads and local streets, as well as the lack of parking facilities and the limitations of transportation services to Old San Juan, dissuade many people from visiting the numerous recreational and tourist facilities that exist in the district. The proposed project improves access to these facilities by providing private automobile parking in the available parking spaces at the Bithorn/Clemente Sports Complex or the Plaza Las Americas Shopping Center, and travel from there to Old San Juan by using the feeder bus and ferry system.

Additionally, during weekends the ferry trip will constitute a pleasant voyage for people from every town on the Island as well as for tourists.

The Bithorn/Clemente Sports Complex is another of the most important centers of passive and active recreation in the SJMA. Easy and fast public transportation access will be provided by the project from the NCSJ, Old San Juan and Catano.

The existing Parque Central, located near the intersection of the Martin Pena Channel and Kennedy Avenue actually is the most important active recreational facility in the SJMA. This facility, as well as those proposed alongside the western section of the channel, such as the Theme Park, would be benefited by the project should intermediate terminals be provided in the future.

In addition, the dredging of the channel would allow recreational boating use of the waterway.

5. Property Value

The improvement in access to a developable area generally increases land value. In this case, a slight increase in the land values of the undeveloped lands of the NCSJ is expected due to the proposed project.

6. Local Tax Base

No direct effect on the local tax base is expected due to the project. However, it will accelerate the development of the vacant lands within the NCSJ, causing an indirect positive effect on property and income tax collection. The Municipality of San Juan would also collect additional revenue from the business licenses.

7. Employment

The SJMA is suffering a serious problem of unemployment (nearly 20%). Due to the decline in construction activity, construction workers are experiencing higher than average unemployment. The proposed project will help to alleviate this problem during the construction phase.

C. AESTHETICS

The construction of the channel will improve the conditions of its water and will help reduce its degradation. The ecology of the area will benefit with the reduction of nutrient overload and excessive sedimentation. This will improve the aesthetic quality of the environment along the channel. While under construction, the aesthetic appearance of the water in the channel will be unavoidably disturbed. After the completion of the project, this condition will disappear and the appearance of the site will improve.

The project will provide the users of the ferry system visual access to one of the few natural areas that remain in the heart of San Juan Metropolitan Area. They will have the opportunity to sight shore-birds, gulls and terns. As many as 5,000 birds of 70 avian species might be contemplated by the users of the system.

No negative aesthetic effect will result from the construction or operation of the busway.

D. NOISE

Since the motor vehicle is the major noise source in the metropolitan area, the assessment of the noise impact of a transportation project is highly important. The noise impact has been evaluated separately for the two separate phases: construction and operation.

1. During Operation

For the assessment of noise impact for a transportation project during its operation, two criteria must be taken into consideration. The first criterion consists of comparing the noise levels during the critical hour in the design year with the design noise levels established by the Federal Highway Administration (FHWA). If the future noise level (after the implementation of the action) is higher, a negative impact will occur. The second criterion consists on comparing the noise level at the critical hour in the design year with the noise level at the critical hour under existing conditions (before the construction of the project). This criteria has been accepted by FHWA, and according to the manual "Highway Noise: A Design Guide for Highway Engineers", the impact determination is made according to the following:

<u>Increase in Noise Level</u>	<u>Degree of Impact</u>
0 - 5 dBA	No Impact
6 - 15 dBA	Some Impact
Over - 15 dBA	Great Impact

The "critical hour" for highway noise purpose is that hour in which the facility operates at a level of service "C". This is the level of service at which the combination of traffic volume and velocity produces the highest noise levels.

Several mathematical models have been developed for the computation of future noise levels. These models are also used for the computation of the existing critical noise levels when a highway is the dominant source. In order to obtain reliable results the model must be validated. For the validation, it is necessary to take noise measurements on a site where the conditions are similar to the expected conditions on the site where the model will be used to calculate future noise levels.

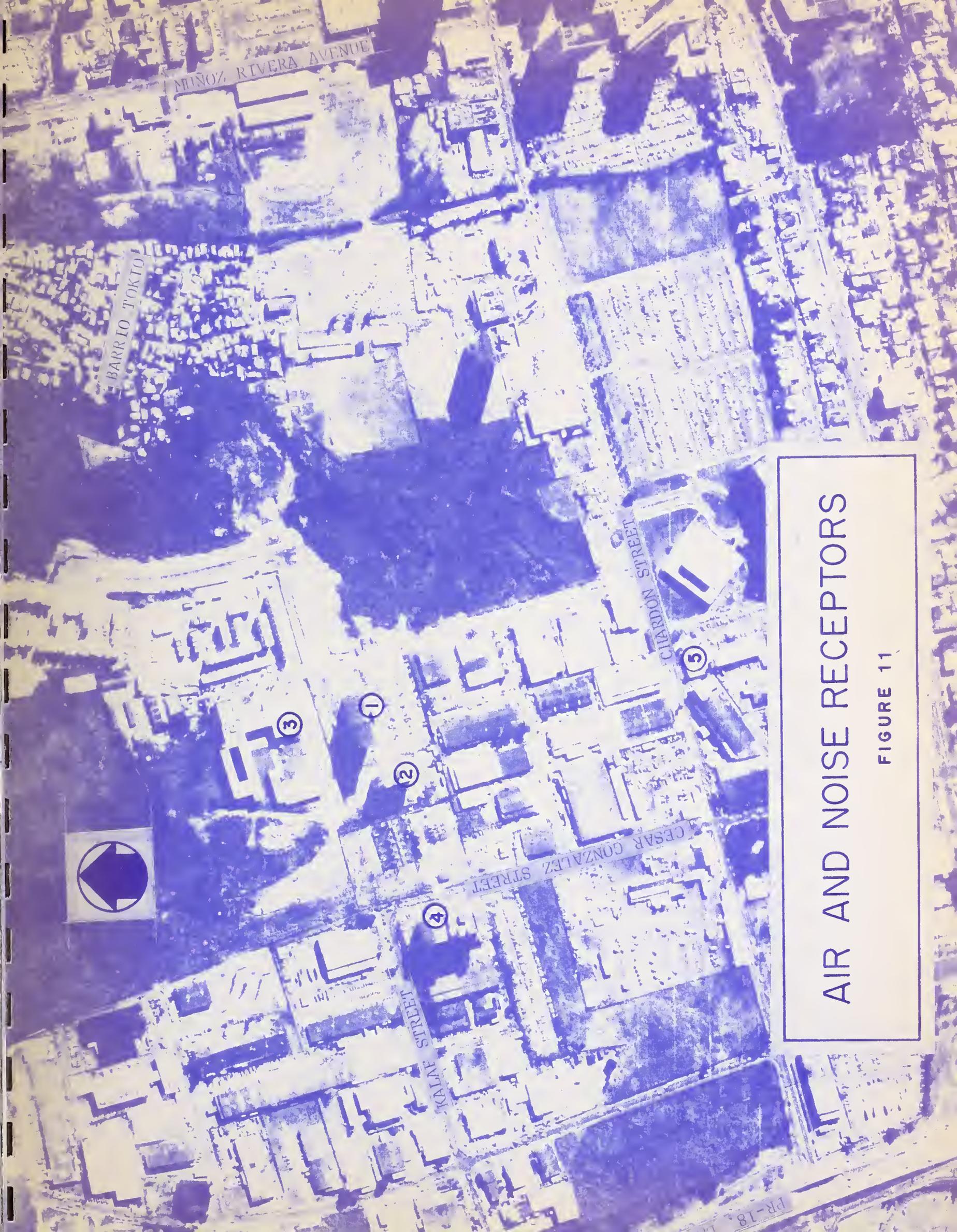
FHWA, under the provisions of the Federal-Aid Highway Act of 1970, has established design noise level criteria to limit the impact of highway noise on adjoining lands (See Table 12). The single number descriptions of a noise environment, either Leq or L10, are the standards developed from research data that represent what has been determined as acceptable noise levels for particular land uses and its associated human activity; these noise levels should not be objectionable to the majority of persons exposed to them.

In order to know the existing noise condition at the project area, noise readings are taken. These readings were taken at five (5) representative sites along the proposed busway alternative corridors. See Section III B.3 for the receptor's locations and results of the readings. In addition to measuring the existing noise levels at the selected receptors, the measurement at receptor 5 was used for the validation of the mathematical model.

TABLE 12

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS (FHPM 7-7-3)

<u>Land Use</u>	<u>Design Noise</u>	<u>Description of Land Use Category</u>
A	60dBa (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	70dB(A) (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas and parks.
C	75dB(A) (Exterior)	Developed lands, properties or activities not included in categories A and B above.
D	--	Undeveloped land (ref. paragraphs 5A(5) and (6) of PPM 90-2).
E	55dB(A) (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.



AIR AND NOISE RECEPTORS
FIGURE 11

The mathematical model used for the computation of future noise levels was the "FHWA Highway Traffic Noise Prediction Model". It was developed by the FHWA, and is the most precise model presently available. A brief description of the model is included in Technical Report B.

The existing environment in the area of the New Center of San Juan is comparatively quiet, except for the noise caused by construction activities, vehicles parking and aircraft. This noise condition is known as "background noise". As development including the streets system occurs in the vacant area of New Center, the ambient noise will increase. As the project is considered for construction in 1985, during the initial years of its operation, the busway would be the dominating noise source at some receptors, at least during some hours of the day. As development occurs, the dominant noise source will gradually change vehicle traffic noise. At the same time, the number of receptors exposed to the busway noise will increase. Although only noise levels for the existing condition and for the design year (2000) are normally taken into consideration for the purposes of impact determination, noise forecasts were also made for 1985 in this case to show the impact on partial development of the area. It has been assumed, for purposes of noise calculations, that the New Center will be totally developed by the year 2000.

Noise calculations were made for the four (4) busway alternatives and the "no-build" alternative. No future receptors were taken into consideration for noise impact analysis. However, the impact analysis for the selected existing receptors is valid also for any future development since the prevailing traffic and physical parameters will be similar.

The predicted noise levels are presented in Table 13. As can be observed, the future noise levels will not exceed the FHWA design levels currently in force, although they will be near the limit at some receptors. This is due primarily to the expected low speed traffic on New Center streets. The only receptor to exceed the 67 dBA level is at the Land Administration Offices, for which the applicable design level is 72 dBA (Leq).

In terms of increase of the existing noise levels, increases in the order of zero (0) to 7.6 decibels will be experienced. However, this increase is due primarily to future growth in automobile traffic. During the calculations it was found that the buses' contribution to the future noise levels is insignificant for those alternatives and segments of alternatives which operate on the street system either in mixed traffic or on reserved lanes. This is because of the low bus volumes expected in comparison to the total vehicles traffic: 22 to 44 buses per hour against a total vehicle volume of 2,400. The bus traffic contribution to the total noise levels is in the order of one (1) additional dBA. This can be observed in Table 13 by comparing the levels for the build alternatives with the "no-build" alternative.

NOISE LEVELS PREDICTIONS FOR BUSWAY ALTERNATIVES (dBA) 1/

Table 13

Receptor <u>2/</u>	All Alternatives Existing (1983)		No-build		Alternative 1		Alternative 2		Alternative 3		Alternative 4	
			1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
1. San Juan Tower	61.8		63	66	63	63	63.5	66.5	63	66	63.8	67
2. P.R. Bar Association Elderly	61.1		62	65	62.5	65.5	62.5	65.5	62	65	62.8	66
3. Community College of San Juan	59.4		63	66	63	66	63.5	66.5	63	66	63.8	67
4. Department of Public Education	64.8		65	66	66	67	65.5	66.5	65	66	65.7	67
5. Public Land Administration Offices	67.2		67.2	67.2	67.2	67.2	67.5	67.7	68	68.2	67.2	67.2

1/ Noise levels expressed in Leq

2/ See Figure 9 for the location of the receptors

The situation is different for Alternative 1, where the busway runs on an exclusive bus lane away from automobile traffic between Arterial D and Kalaf Street. The noise generated by the bus traffic in the design year at a distance of 15 meters will be about 62 dBA. This is near the background level expected in the area. Therefore, the buses' noise cannot be considered an intrusive element.

Based on the above, it can be concluded that the noise to be produced by every alternative during its operation is insignificant in comparison with the noise produced by other sources. In addition, no significant difference in terms of noise impact is found among the alternatives during operation.

2. During Construction

Temporary increases in noise levels will occur during the construction of the project. The source of these noises will be very localized and of relatively short duration. The construction noise will be generated primarily by bulldozers, trucks, pavers and graders. Table 14 shows the range of noise levels generated by this type of equipment.

The noise produced on the site will vary, depending on such factors as the phase of the construction, and the type, quantity and location of the equipment employed during the phase. Additionally, the noise produced by a piece of equipment can vary considerably during these different phases of the work cycle.

There are no large cuts or fills that will require extensive use of earth moving equipment and no blasting is anticipated. Moreover, no sensitive receptors are located near the project construction activities, except in the busway segment between Arterial D and Cesar Gonzalez Avenue, should Alternative 1 be selected. Therefore, this alternative is in a slight disadvantage in relation to the others in terms of noise impact during construction.

Noise emissions during construction will be controlled by proper supervision including the use and repair of the equipment, the time of operation, and the location of the equipment. All equipment shall be fitted with silencers and/or mufflers to minimize the noise. The access to the construction site and the routes used to haul material shall be determined utilizing routes which minimize the noise impact on sensitive receptors.

TABLE 14

CONSTRUCTION EQUIPMENT NOISE LEVELS
(dBA, measured at 15 meters)

<u>Type of Equipment</u>	<u>Range of Noise Levels</u>
Scrapers	89 - 95 dBA
Scrapers, elevating	88
Graders	77 - 87
Dozers	87 - 89
Dozers with squeaky tracks	90 - 93
Rollers, sheepsfoot	72 - 80
Roller, vibrating	80 - 85
Loaders, bucket	80 - 81
Loaders, Terex	96
Backhoe	79 - 85
Backhoe, very large	91
Gradall	87 - 88
Crane	80 - 85
Crane - bad example	95
Trucks, off highway	81 - 96
Trucks, asphalt	69 - 82
Trucks, concrete	71 - 82
Trucks, cement	91
Trucks, 14 wheel	88
Tractors with water pump	73 - 80
Pavers	82 - 92
Autograder	81
Compressors	71 - 87
Rock drill (handheld, pneumatic)	88
Rock drill (track mounted)	91
Concrete saws	87
Concrete saws, chain	88 - 93
Water pumps	79
Concrete pumps	76
Generators	69 - 75
Concrete plant	93
Asphalt plant	91
Pile driver (Vulcan #1)	90

E. AIR QUALITY

1. General

The air quality impact of a transportation project can be divided into the impact during the construction and the impact during its operation. During the construction, the pollution comes primarily from the air-borne dust generated during the earthwork. During the operation, the pollution comes from the gaseous exhaust from the vehicles using the facility. The more significant pollutants of those gases are carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx), for which the automobile emissions account for 81, 70 and 51 percent, respectively, of the total Puerto Rico emissions. Minor amounts of particulate matter and lead also come from vehicle exhaust. A generalized description of each of these pollutants is given in Technical Report A.

The Environmental Protection Agency (EPA) has promulgated standards establishing maximum allowable concentrations for several pollutants during different periods. In order to comply with air quality standards, emissions from motor vehicles are being controlled. Motor vehicles must reduce their emissions to 90 percent of the no-control baseline (pre-1968 models).

The ideal way to determine the project impact on a micro-scale is to calculate the future concentrations of the different pollutants after the project construction and compare them with the existing concentrations and EPA standards. However, only for CO have the experts developed a diffusion mathematical model which allows the calculation of future concentrations. Because of the reactivity of HC and NOx, the dispersion characteristics for these pollutants have not been accurately modeled. Therefore, this study addresses only the principal pollutant (CO) on a micro-scale. Particulate matter will not be addressed since it is a relatively minor motor vehicle problem. Transportation sources account for only 3 percent of the particulates. The use of unleaded gasoline in newer vehicles will eventually result in even lower automotive particulate and lead emissions.

On a meso-scale consideration, independently of the alternative, the project will result in an improvement of the air quality. Since the proposed project will induce private vehicle users to change to mass transit, it will reduce significantly the vehicle-miles to be travelled, and consequently, the pollutant burden.

2. National Ambient Air Quality Standards

The Federal Government, through the Environmental Protection Agency, has adopted national primary and secondary ambient air quality standards for those pollutants for which automotive exhaust is a major source (See Table 15). The primary standards are based on health effects while the secondary standards are based on aesthetic and public welfare criteria. A lead pollutant standard has been recently established and is included in Table 15. Lead pollution is expected to be controlled through the established federal program to take out lead from gasoline. This program includes the reduction of lead in gasoline, the prohibition of the use of leaded gasoline in catalyst-equipped vehicles and reduced gasoline consumption. Since lead is being taken out of gasoline, it will not represent a future air quality problem.

3. Methodology

The model employed in this study for micro-scale CO analysis was prepared by the State of California Department of Public Works, Division of Highways, under the sponsorship of the Federal Highway Administration, as revised (Caline 3). In their application to highway problems, various refinements and modifications are employed under guidelines recommended by the EPA.

Application of the prediction model to a micro-scale analysis requires obtaining data on vehicle and traffic characteristics and on climate. First, climatic and meteorological information is evaluated to determine the most probable conditions for high pollutant concentration. Sensitive receptors or those expected to experience high pollutant concentrations because wind direction and highway orientation are then selected for evaluation. The distance between the receptors and the highway, the wind orientation to the highway, and the stability class determine the dispersion characteristics of the pollutant at the receptor. Wind speed and emission data are then used to compute the point concentration. Concentration is directly proportional to emissions and inversely proportional to wind speed. The receptor sites selected for the micro-scale analysis are shown in Figure 9 and described in Tables 16 and 17. The rationale for their selection was to show CO concentrations at the nearest receptors to the busway, which at the same time are representative of any future development at the same distance from the facility and in the same busway section.

Table 15 National Ambient Air Quality Standards

Pollutant	Averaging Time [†]	Primary Standards*	Secondary Standards*
Particulate Matter	Annual**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
	24 hour	260 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$
Sulfur Dioxide	Annual ^{††}	80 $\mu\text{g}/\text{m}^3$ (0.03 ppm)	-
	24 hour	365 $\mu\text{g}/\text{m}^3$ (0.14 ppm)	-
	3 hour	-	1300 $\mu\text{g}/\text{m}^3$ (0.5 ppm)
Carbon Monoxide	8 hour	10 mg/m^3 (9 ppm)	Same as primary
	1 hour	40 mg/m^3 (35 ppm)	Same as primary
Nitrogen Dioxide	Annual ^{††}	100 $\mu\text{g}/\text{m}^3$ (0.05 ppm)	Same as primary
Photochemical Oxidants	1 hour	160 $\mu\text{g}/\text{m}^3$ (0.08 ppm)	Same as primary
Hydrocarbons (nonmethane)	3 hour (6 to 9 am)	160 $\mu\text{g}/\text{m}^3$ (0.24 ppm)	Same as primary
Lead	Quarter	1.5 mg/m^3	Same as primary

*Standards are given in microgram per cubic meter ($\mu\text{g}/\text{m}^3$), milligram per cubic meter (mg/m^3), and in parts per million (ppm).

[†] Except for the annual standards, all standards are specified as not to be exceeded more than once a year.

**Geometric mean.

^{††} Arithmetic mean.

4. Micro-scale Analysis for Carbon Monoxide

In applying the model to the micro-scale analysis, certain conditions were imposed in order to develop the most conservative estimates of pollutant concentration at the receptors. The greatest potential for adverse air quality occurs during stable atmospheric conditions that have a tendency to suppress vertical motion and thus contain air pollutants at lower elevations. Stability "F", the most stable surface condition (and consequently, the condition most conducive to air pollution), was selected to predict air pollutant concentrations. A low wind speed of 2 miles per hour, although not necessarily the prevalent wind speed for the stability class and wind directions used, was selected in order to simulate the worst conditions. Further, the angle of the wind with the highway was assumed as being nearly parallel for receptors at distances shorter than 18 meters and nearly perpendicular for receptors at distances larger than 18 meters from the busway to allow the greatest "accumulation" of pollutants.

As indicated in Table 15, ambient air quality standards have two restrictions--an allowable pollutant concentration level and a time limit on the duration of that pollutant concentration. To simulate the worst pollutant levels, the maximum traffic volumes were used in conjunction with the most unfavorable atmospheric conditions.

Predictions of CO concentrations for the receptors and busway alternatives considered during the years 1985 (estimated time of completion of the project) and 2000 were made for the most probable and worst meteorological conditions. The predictions for the year 2000 were made assuming total development of the New Center of San Juan.

To compare the air quality consequences attributed to each busway alternative, including "no-build", a summary of the CO concentrations for the above-mentioned receptors is shown in Tables 16 and 17. These tables assumed background values of 2.5 PPM for 1985 and 1.5 PPM for the year 2000 which is probably an over-prediction.

As can be observed in those tables, the CO concentrations will be well under EPA's standards for every receptor and year. In addition, those values will be almost equal for all the alternatives, including "no-build", for both, 1985 and 2000. This is due to the low contribution of buses to the total concentration (0.0-0.01 PPM). Therefore, no significant differences are expected between the different alternatives from the air quality standpoint due to the operation of the project.

Table 16

CO Concentrations (PPM)¹
Most Probable Meteorological Conditions

Receptor ²	No-build		Alternative 1		Alternative 2		Alternative 3		Alternative 4				
	2000		1985		1985		1985		1985				
	1 Hr. 8 Hrs.												
1. San Juan Tower	2.76	2.69	2.64	2.36	2.84	2.75	2.66	2.64	2.69	2.71	2.66	2.69	2.39
2. P. R. Bar Association Elderly	2.64	2.60	2.51	2.26	2.50	2.59	1.93	1.82	2.60	2.61	2.51	2.26	1.83
3. Community Technological College	2.76	2.69	2.28	2.09	2.76	2.64	2.26	2.07	2.76	2.72	2.66	2.26	2.07
4. Department of Public Education	2.76	2.69	2.64	2.36	2.50	2.75	2.66	2.37	2.76	2.71	2.66	2.69	2.39
5. Public Lands Administration Offices	4.00	3.63	2.70	2.40	4.00	3.68	2.74	2.43	4.01	4.00	3.63	2.30	2.70

1. Background concentrations of 2.5 ppm and 1.5 ppm were assumed for years 1985 and 2000 respectively

2. See Figure 9 for the location of the receptors

3. 1985 is the estimated time of completion of the project.

TABLE 17

CO Concentrations (PPM)¹

Worst Meteorological Conditions

Receptor 2	No-build		Alternative 1		Alternative 2		Alternative 3		Alternative 4						
	2000		2000		2000		2000		2000						
	1 Hr. 8 Hrs.														
1. San Juan Tower	2.76	2.69	2.64	2.36	2.75	2.66	2.37	2.76	2.69	2.64	2.36	2.71	2.66	2.69	2.39
2. P. R. Bar Association Elderly	2.70	2.65	2.59	2.31	2.69	2.17	2.00	2.70	2.65	2.59	2.31	2.68	2.64	2.23	2.05
3. Community Technological College	2.76	2.69	2.28	2.09	2.68	2.26	2.07	2.76	2.69	2.28	2.09	2.72	2.66	2.26	2.07
4. Department of Public Education	2.76	2.69	2.64	2.36	2.51	2.51	2.37	2.76	2.69	2.64	2.36	2.71	2.66	2.69	2.39
5. Public Lands Administration Offices	4.00	3.63	2.70	2.40	4.07	3.68	2.43	4.01	3.63	2.57	2.30	4.00	3.63	2.70	2.40

1. Background concentrations of 2.5 ppm and 1.5 ppm were assumed for years 1985 and 2000 respectively

2. See Figure 9 for the location of the receptors

3. 1985 is the estimated time of completion of the project

Predicted CO concentrations for the year 2000 are smaller than those for the year 1985 for every alternative, including "no-build", notwithstanding the higher traffic volumes expected along the arterials of the New Center of San Juan for the year 2000. This is due primarily to Federal law, which requires the incorporation of emission control devices in all new motor vehicles.

5. Impact During Construction

The air pollution during this phase will be caused primarily by dust emissions from earthwork operations and the emissions from heavy construction equipment. This will be a temporary adverse effect which is not considered significant. In those sections where busway construction would be necessary, no sensitive receptors exist. Alternative one requires the construction of the busway on the Metro right-of-way from Arterial D to Kalaf Street, where developments such as San Juan Tower and the Bar Association Elderly Housing already exist. Therefore, although this is not considered a significant difference, Alternatives 2, 3 and 4 are better than Alternative 1 from the point of view of air quality during construction.

A series of control measures shall be implemented during this phase so as to mitigate the environmental impact by dust emissions. At a minimum, the control measures will consist of the following:

- (1) Use of tarpaulins to cover all loaded trucks to prevent dust emissions.
- (2) Spraying of water on the soil where the ground cover has been removed to keep it dust free.
- (3) Periodic cleaning of heavy equipment tires, especially during the periods of heavy rain to keep adjacent streets mud free.

The successful application of these measures requires strict supervision on the part of the Department of Transportation and Public Works of Puerto Rico (DTPW). These measures will be appropriately implemented resulting in no significant dust problem in the areas surrounding the land section of the project.

During the construction phase, the project should be considered as a prime pollutant emission source (dust emission essentially) as defined in Section 3.1 of the Air Quality Regulations of the Environmental Quality Board (EQB). For this reason, the contractor, in coordination with the DTPW, will have to apply for and obtain the corresponding "approval for the construction or operation of emission sources in Puerto Rico" from the Air Division of the Commonwealth's EQB, before commencing construction activities.

6. Consistency with the State Implementation Plan

The Clean Air Act Amendments of 1970, in addition to establishing national ambient air quality standards (NAAQS), also require that each state prepare a plan for the implementation, maintenance and enforcement of such standards. In 1978, an implementation plan was submitted by the Commonwealth Environmental Quality Board entitled "Clean Air for Puerto Rico". This plan was designed to serve as standard against which governmental performance may be judged, and to satisfy the requirements of the Clean Air Act. It identifies Puerto Rico as a Class III area for carbon monoxide, hydrocarbons and nitrogen dioxides. This classification applies to areas in which deterioration up to the standard would be considered insignificant.

Considering the above, the strategy for the control of the air quality deterioration due to motor vehicles related pollutant sources, relies on Federal Law, which will require pollution control devices on all new motor vehicles. In addition, the plan establishes that, despite anticipated growth in the number of motor vehicles and other sources, CO concentrations are expected to continue to comply with the national standard.

Results of the micro-scale study show an insignificant increase of from 0 to .01 PPM due to the proposed project. All the predicted CO concentrations are well below the NAAQS for both, one (1) and eight (8) hour periods. These values were determined considering the most critical and severe traffic and meteorological conditions.

Based on the results of the above study, it is determined that the construction of Agua-Guagua project is consistent with the Air Quality Implementation Plan for the San Juan Metropolitan Area.

F. ENERGY

Transportation may be described as the act of moving an object from one location to other. To perform this action, certain impeding forces such as gravity, friction, etc., must be overcome. To do so and achieve the desired transportation, work must be performed, which requires the expenditure of energy. The transportation systems have been identified as the principal energy consumer of all man's activities. Considering this reality, and the foreseen future energy crisis, it is important to evaluate the proposed Agua-Guagua project from this point of view.

Transportation - related energy is usually separated into two main categories: direct and indirect.

"Direct" is defined as the energy consumed in the actual propulsive effort of a vehicle, such as the thermal value of the fuel or the amount of electricity used in the engine or motor. "Indirect" is defined, in the broadest terms, as all the remaining energy consumed to construct and run a transportation system. It may be divided into two sub-categories: central and peripheral energy. Central energy encompasses all the energy resources used indirectly in building and operating a transportation system. "Peripheral energy change" recognizes energy resources that are not used in any manner by the system itself. Rather, it addresses the potential effect that a transportation system may have on energy use and availability in the area it serves, including the potential attractiveness of energy consuming developments by the project.

Of both energy categories, the direct energy is the most significant one, requiring in-depth analysis.

Any mass transit project such as the proposed Agua-Guagua, will result in less energy consumption. This is due to the fact that the mass transit system attracts passengers from private automobiles, which results in fewer vehicle miles travelled. In the case of the proposed project, users of both private vehicles and MBA bus system will be attracted to the combined ferry and busway system.

For the direct energy consumption analysis, the estimated number of users of the proposed system for the years 1985 and 2000 was distributed onto other available transportation modes such as buses and private vehicles in order to represent the "no build" condition and compared to the build alternatives. The energy consumption by the ferry system will be equal for all build alternatives. The same is not true for busway alternatives. Therefore, direct energy calculations were performed for every busway alternative and the "no-build". The results are presented in Table 18, expressed in British Thermal Units (BTU's). In order to provide a common unit to which a layman can relate, and to facilitate comparisons between alternatives, the final values obtained through the study are converted to "equivalent barrels of crude oil" (Bbl). See Table 19.

As can be observed in Table 19, the build alternatives would consume from 11 to 22 times that energy which would be consumed should the project not be constructed. Therefore, the project can be considered highly advantageous in terms of direct energy consumption.

Comparing the results for busway alternatives, the order from lower to higher direct energy consumers varies for the years 1985 and 2000 as follows: 2, 4, 1, and 3; and 2, 1, 4 and 3, respectively. The worst alternative consumption would be approximately twice that for the best one, for a difference of 272 and 456 barrels of crude oil per year for the years 1985 and 2000, respectively. These differences cannot be considered significant. The resulting differences between the alternatives by year are due to the differences in busway length and expected speeds on each alternative.

TABLE 18

DIRECT ENERGY CONSUMPTION (BTU/YEAR)

Contribution From	No-Build		Busway Alternative 1		Busway Alternative 2		Busway Alternative 3		Busway Alternative 4	
	1985	2000	1985	2000	1985	2000	1985	2000	1985	2000
Ferry System	0	0	7.23×10^5	9.86×10^5	7.23×10^5	9.86×10^5	7.23×10^5	7.23×10^5	7.23×10^5	9.86×10^5
Busway	0	0	3.08×10^9	4.41×10^9	2.06×10^9	2.82×10^9	3.64×10^9	5.47×10^9	2.90×10^9	5.01×10^9
Other Buses	7.44×10^{10}	9.07×10^{10}	0	0	0	0	0	0	0	0
Automobiles	4.13×10^{10}	5.19×10^{10}	0	0	0	0	0	0	0	0
Total	4.14×10^{10}	6.10×10^{10}	3.08×10^9	4.41×10^9	2.06×10^9	2.82×10^9	3.64×10^9	5.47×10^9	2.90×10^9	5.01×10^9

TABLE 19

ANNUAL DIRECT ENERGY CONSUMPTION (Bbl)

	<u>Consumption</u>		<u>Ratio: No Build/Build</u>	
	1985	2000	1985	2000
No Build	7128	10501	-	-
Busway Alternative 1	530	759	13	14
Busway Alternative 2	355	486	20	22
Busway Alternative 3	627	942	11	11
Busway Alternative 4	499	863	14	12

No significant differences in energy consumption among waterway and busway alternatives are anticipated during construction and maintenance activities.

In terms of peripheral energy, the proposed project is expected to accelerate the development of the vacant lands in the New Center of San Juan, which will consume additional energy. However, this is not considered a significant effect since those lands will be developed eventually regardless the construction of Agua-Guagua.

G. ECOLOGY

1. General

Because of the high degree of interdependency and exchange between mudflat communities and adjacent communities, it is impossible to consider the functioning of any one community without considering others. As a result, the entire wetland system, including marshes, mudflats, mangroves, bay and the tidal channel must be considered as one productive unit. The wetland ecosystem includes not only the biotic assemblages of organisms but their interaction with the biotic physical environment as well. This interaction of the living and non-living components defines specific energy flow patterns, biotic diversity and material cycles which make up an ecosystem.

The trophic structure of any ecosystem has two characteristic components: the autotrophs or primary producers and heterotrophs, which must obtain organic compounds from the environment by decomposition of more complex material. In the wetland ecosystem, the main sources of primary production are vascular plants such as marsh grasses and mangroves. However, the wetland ecosystem is not entirely dependent on vascular plants as a sole source of primary production. Benthic diatoms or microalgae, which are abundant in tidal flat sediments and on stream banks, constitute an important production water depth and turbidity. Also of significance is that the contribution of the benthic diatoms to the overall primary production of the wetland ecosystem is not a seasonal occurrence and functions at approximately the same rate throughout the entire year.

2. Impacts

The proposed project will have long term beneficial impacts on the wetland ecosystem in the area as well as short and long term, temporary and mitigable negative impacts.

Positive long term impacts are expected from the improvement in tidal induced flushing of the channel which should help in the recreation of the waters and in the increase of the exchange of nutrients between the channel and the surrounding terrestrial community. This will have a positive effect on the food chain in the ecosystem.

Table 20 shows a matrix of the proposed activities and their impacts on the different elements of the ecosystem. In general, these impacts are mitigable.

At the present time there are 198 acres of mangrove along the western section of Martin Pena Channel. The preferred alternative requires the permanent elimination of 6.36 acres of mangrove, about 3.21 percent. An additional temporary mangrove taking is necessary during the bulkhead construction. The permanent mangrove elimination will result in the loss of some biological productivity and the food resources now available.

Approximately 10 acres of mudflats along the channel and the bay entrance will be lost with the construction of the channel. Birds that take their prey from the mudflats will have less area to use as resting sites and for food sources. However, existing mudflats along the meanders in the channel will remain undisturbed. Only a small portion of the mudflats in the San Juan Bay, which are the primary food source and rest area for two endangered species, will be affected.

Traffic in the channel will have some impact on the birds that use the narrow fringe of red mangrove trees close to the channel as their habitat. Egrets, herons and rails will be the most affected birds.

3. Mitigation Measures

The minimization of mangrove and mudflat taking was provided for during the development of alternatives and the selection of the preferred alternative (see Table 21). In addition, the preferred alternative provides for the protection of the remaining areas of mangrove by means of a bulkhead system against the possible damage due to erosion caused by vessel wakes (see Section II.B.1). It will also allow tidal flow into the mangroves.

The working area to be altered during bulkhead construction will be restored to its original condition. Thus, the mangroves disturbed in the area close to the bulkheads will return after construction. Only mangrove within the 200-foot channel cross section (including buffer zones) will be permanently eliminated.

Table 20

Matrix of Proposed Activities and their Impacts in the Ecosystem

Environmental Quality Parameter Affected	ACTIVITY CAUSING IMPACTS		
	Channel Dredging and Straightening	Channel Revetment	Canal Traffic (Long Term Impact)
1. Mangrove Swamp	X	X	
2. Mudflats	X	X	X
3. Avifauna	X	X	
4. Wilderness and Open Spaces	X	X	X
5. Food Chains			X
6. Endangered Species	X	X	X

TABLE 21

CONSTRUCTION COST AND TOTAL AREA OF MANGROVE REQUIRED

Alternative	Total Cost (\$)	Area of Mangrove to be taken (Acres)	Ratio of Area of Mangrove to be taken/ Total Mangrove Area alongside the existing canal	Protection of Remaining Mangrove Against wake Action?
1-100' with turnouts	4,837,000	6.5	3.28	No
2-100' with turnouts and bulkheads	7,048,000	1.73	0.87	Yes
3-100' with turnouts and revetted dikes combined with bulkheads	25,291,000	31.20	15.72	Yes
4-180'	6,900,000	14.13	7.12	No
5-180' with bulkheads	9,111,000	6.36	3.21	Yes
6-180' with revetted dikes combined with bulkheads	28,812,116	40.21	20.27	Yes



LEGEND :



AREAS WHERE MANGROVE IS EXPECTED TO GROW NATURALLY



PROPOSED AREAS FOR MANGROVE PLANTING

COMPENSATION AREAS FOR MANGROVE LOSS

There are existing channel segments where, due to water depth, mangroves do not extend up to the proposed bulkheads. No mangroves need be destroyed at those sites. On the contrary this area between the existing mangroves and the proposed bulkheads could eventually be naturally filled or filled during construction to make it shallow enough to allow the mangrove to spread into these areas. To some extent this compensates for the expected permanent mangrove loss at other sites. In addition as a mitigation measures 7.19 acres of mangroves will be planted alongside existing Tres Monjitas Channel as part of the project. The proposed area for revegetation is shown in Figure 11.A.

In relation to mudflats, the following mitigating measures will be taken:

- a) Mudflats will be left undisturbed in areas where they naturally develop outside the channel route;
- b) Creation of replacement mudflats using dredge spoil (Figure 12 shows a possible site for this action); and
- c) Dredging and channelization work will not be performed during the winter season, when migratory birds use mudflats.

4. Endangered Species

Two (2) endangered species are found in the project area: the Brown Pelican and the Yellow - shouldered Black-bird. In compliance with the Endangered Species Act, a biological assessment for the determination of the project effect upon these species was conducted and is discussed in this EIS (supra).

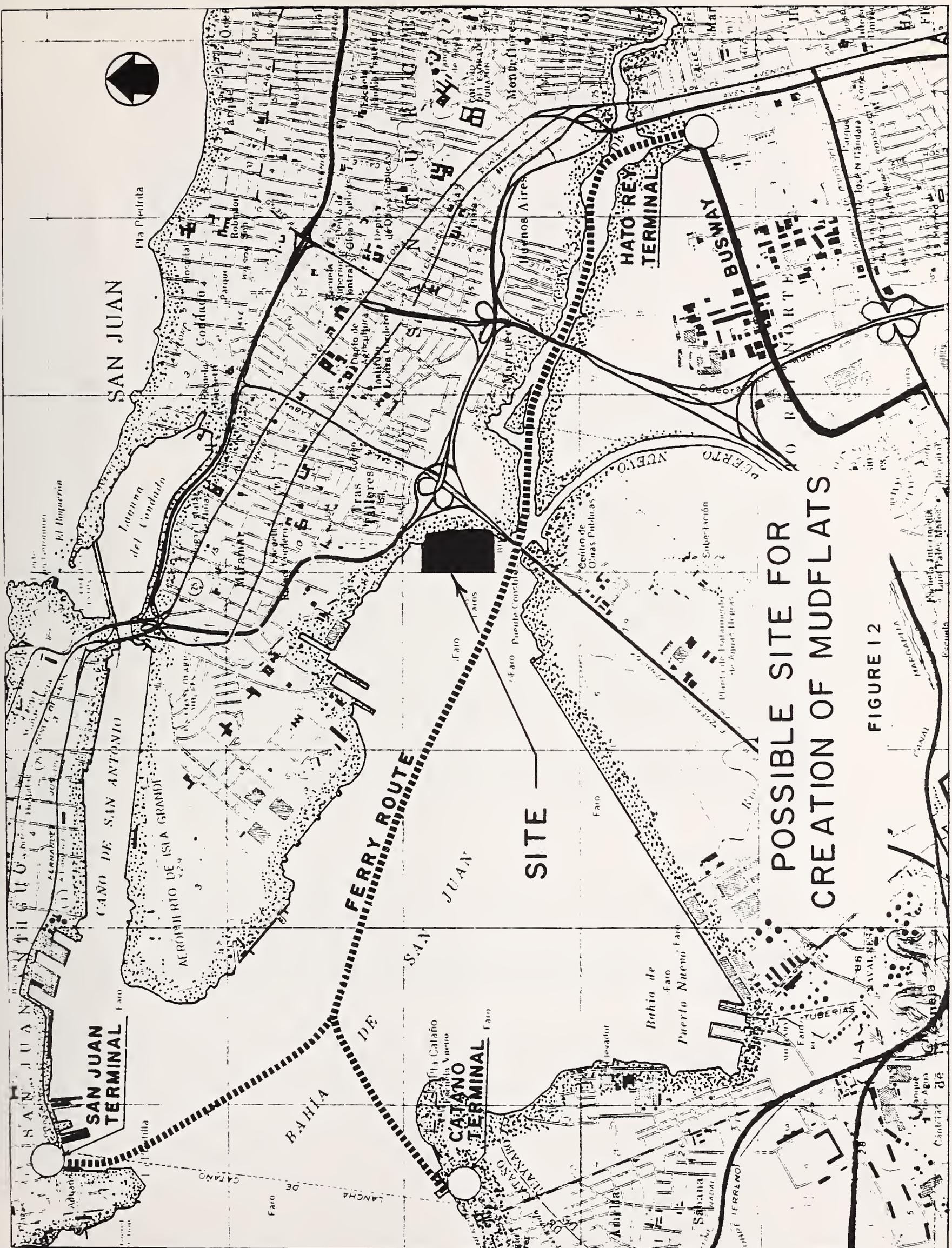
With the provision of the mitigation measures committed to above, the project will have no adverse effect on these species.

H. WATER QUALITY

1. Surface Water

During the dredging process the water quality impacts are principally short-term and include high turbidity, resuspension of contaminated materials into the water column, dissolved oxygen depletion, the release of nutrients and other materials from the sediment and the creation of scum.

With the resuspension of sediment downstream, turbidity may be increased which would temporarily decrease the light transmissivity of waters at the dredging site. The dredging activity will cause the loss of an unquantified number of benthic organisms and will have a temporary negative effect on the resting and living sites of the aquatic organisms in the area. This will cause the temporary migration of these species toward the San Juan Bay area during the construction phase of the project. Sedimentation will also induce temperature changes in the waters of the channel due to a decrease in light transmissivity.



POSSIBLE SITE FOR
CREATION OF MUDFLATS

FIGURE 12

Additionally, some erosion and sedimentation in the Martin Pena Channel may occur due to the earthwork necessary for the construction of the main terminal and the busway, and the runoff from the busway during its operation.

The effects of stormwater runoff, seepage or infiltration of toxic materials on accidental spillages; either during construction or operation phases, are considered as influencing the water quality of nearby surface bodies of water. The flow of gasoline, oil, metals, and herbicides (adhered to sediments or in solution) into the surrounding surface waters would place in danger both the aquatic life and vegetation of the mangrove community. Sound construction and operational practices will prevent any significant impacts from waste spillages.

It is a current practice for water pollution control during and after construction activities to provide the project area with erosion control measures. These activities require the use of fertilizers to supply the required nutrients to the new vegetation cover. Impacts on the area's surface waters due to the use of fertilizers may include uncontrolled algae growth and eutrophication.

During the operation of the project, after its construction, the water quality of the channel is expected to improve. The sewage and solid wastes discharges in the Ochoa and Martin Pena Channels in the area of Barrio Tokio will have stopped. Erosion and sedimentation is expected to decrease, which will help in the reduction of the frequency of dredging operations for maintenance purposes. Shoaling of the navigation channel would tend to occur in the channel from material carried from the easterly portion of the Martin Pena Channel. Polluted water from this part of the channel is also expected to enter into the channel but it is expected to be diluted rapidly by the flushing of the channel. Both channelling alternatives, bulkhead and dike system, would help alleviate the shoaling in the channel due to expected bank erosion caused by wave action on the mud banks. Maintenance dredging in the channel will be required. With the improvement on the water quality, the food chains are expected to improve.

2. Groundwater

A recent U.S. Geological Survey (USGS) investigation describes the groundwater aquifer in the project area as being entirely saltwater contaminated. Since salinity levels already render groundwater unsuitable as a water source, excavation in the San Juan Harbor and the Martin Pena Channel is not expected to have significant impact on the aquifer.

3. Mitigation Measures

The dredging operation in the area will be monitored and should turbidity become excessive, the excavation will be enclosed by silt barriers or temporarily stopped. If necessary, work could be scheduled to allow regular periods in which no dredging would be performed in order to reduce turbidity problems. This would result in additional dredging costs. Other turbidity control measures include the use of specialized equipment, such as the completely enclosed clamshell bucket, and the underfilling of dump scows that would transport the material to the disposal site in case of ocean dumping.

In order to avoid the negative impacts of erosion and sedimentation due to the construction of the terminal and busway, the following mitigation measures will be implemented:

- Seeding should be provided to stabilize parallel areas, control runoff, and reduce the erosion rates. Careful management of applied nutrients and pesticides should be planned and performed during and after construction activities.
- The busway design must provide an appropriate drainage system to avoid erosive actions due to the busway's water runoff.
- Exposed soil surfaces during construction should be minimized by trying to return them to a runoff controlled surface as soon as possible. Special grading practices, staging of construction activities, and soil revegetation are valuable measures in attaining this objective.
- Depending on site conditions, diversion structures, sediment traps or other practices for erosion control, should be used so that sediments are trapped before runoff waters reach stream or other surface waters.
- Good operation and maintenance of equipment during the construction period will be exercised to control pollutants other than sediments.
- During and after construction all storm sewer inlets will be protected against sediments.

Other mitigation measures will be:

- (1) Strict control measures will be taken in order to avoid any accidental spillage in the channel either during construction or operation.
- (2) Measures will be taken during the operation of the ferry in order to prevent littering the waters of the channel by passengers and crew.

I. SOLID WASTE

Solid waste generated by the project will consist of the materials utilized in the construction of the Hato Rey terminal, the solids dredged from the channel and materials utilized in the construction of structures for the busway as well as the solids generated due to the clearing and grubbing for the construction of the busway.

Non-dredging waste will be disposed of in the municipal dump. No estimates are available at present of the quantity of solid waste that will be generated by non-dredging activities of the project, but no impact on the municipal dump is expected due to this action. The contractors shall be responsible for the collection and haulage to the disposal site after requesting and granting of a permit by the Environmental Quality Board.

For the disposal of the material to be dredged from the Martin Pena Channel two alternatives were considered: upland disposal and ocean disposal. Preliminary estimates of the material to be dredged from the channel for each alternative are shown on Tables 2 through 7.

Ocean disposal of the dredge material is much less costly while having less environment impacts than up land disposal. Therefore, the Department of Transportation and Public Works prefers ocean disposal of the dredged material and will request the Corps of Engineers and EPA's concurrence with the application of an Ocean Dumping Permit.

Upland Disposal Alternatives

An area of approximately 275 acres filled to a height of 20 feet would be required to contain the material excavated in Alternatives 1 and 3, which are the alternatives requiring the dredging of least material. For Alternative 6, the alternative with the most material, approximately 473 acres filled to a height of 20 feet would be needed. The probability of reutilization of the dredged material is limited by the high plasticity and lack of supporting capacity of these silty and organic materials making the selected sites unsuitable for future development. The disposal site would be detrimental to the area unless measures are taken to prevent deterioration. The project area is highly urbanized, limiting the alternative sites that can be utilized.

Because of planned development or restrictions on other upland sites, only two sites for upland disposal are available in the area. The first is the area adjacent to the channel where Barrio Tokio presently stands. There would be approximately 15 acres available for land disposal, after relocation of the families in the Barrio takes place, which is less than the required area. This alternative would also constitute an aesthetic hazard and would create an unpleasant situation for the new residential development in the area. The second possible alternative would be the San Juan Dump site near Constitution Bridge. The city dump is already over its capacity and the disposal on this site would increase the problem. Figure 13 shows the location of these sites.

Ocean Disposal Alternative

This alternative contemplates the discharge of all the dredged material in the EPA interim-approved ocean disposal site located at latitude 18'30' and longitude 66'09'. The site is approximately 2.8 miles northwest of the entrance to San Juan Harbor and is located on the Continental slope in over 600 feet of water.

Offshore disposal requires that work boats haul dump scows to a tug boat in the San Juan Bay and from there to the preselected open-water site, where the material would be disposed.

The material dumped into this site is expected to fall immediately to the ocean floor. The average fill depth is expected to be between 6 to 8 feet. Turbidity generated by the disposal will temporarily decrease the light transmissivity of the waters at the site. Some plankton will be lost by this action but its effect will be temporary, ending when discharge is completed. An unquantified number of benthic organisms will be covered by the discharge of the dredge material. The size of the disposal site, which is a 5,000 square foot area, the water depth along with the effects of surface and subsurface currents and wave actions, and the nature of the material, will result in uneven distribution of the material on the sea floor. This will produce uncertain effects on benthos. Any species which are dependent on the existing benthos for food sources will also be affected. Those with sufficient mobility will temporarily move to undisturbed sites. Some changes in the geometry of the bottom surface can be expected with the disposition of 810,000 to 2,000,213 cubic yards of dredged material. Discharge of the material will not have an adverse effect on the salinity gradients.

For the purposes of determining the impacts of ocean dumping sediments from three locations in the channel were sampled and tested for: 1) toxicity, 2) potential contribution to bioaccumulation, and 3) chemical content of elutriate. In addition, water from the Channel was chemically analyzed. Methods followed those outlined in the EPA/COE Manual, entitled "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters; Implementation Manual for Section 103 of Public Law 92-532 (Marine Protection, Research, and Sanctuaries Act of 1972)" (July 1977).

Most of the tests conducted and analyzed according to the EPA/COE Manual showed sediments from Martin Pena Channel to be safe for ocean disposal; however, possible potential adverse effects on shrimp survival were shown for one of the three sediments tested, potential bioaccumulation of cadmium by clam worms was demonstrated.

A technical report was prepared regarding this matter. It shows the chemical analyses of dredged material. It is available upon request.

The dredged material to be dumped into the ocean will be diluted to 0.027 percent when mixed through the release zone. This is 36.8 times more than the one percent dilution required for nontoxic suspended particulate phase (SPP). This dilution will mitigate the adverse impact of ocean dumping this material.

Additionally, through meetings held with the Environmental Quality Board of Puerto Rico, it was determined that it was necessary to analyze the soil and the benthic sludge from the Martin Pena and Ochoa Channels to evaluate their potentially hazardous characteristics. Sampling activities were conducted on March 29 and 30, 1983. The samples were sent to a private laboratory facility, Mead CompuChem Laboratories located in Research Triangle Park, North Carolina. Laboratory results indicated that the sludges under study do not exhibit any hazardous characteristics, as defined in the code of Federal Regulations, Title 40, Part 261. Concentrations of pollutants like pesticides, herbicides, toxic volatile organic compounds, PCB's and metals were found to be well below standards established under the related local/federal regulatory guidelines. A technical report was prepared regarding this matter. It is available upon request.

No sport or commercial fishing takes place on the ocean dumping site. Therefore, this action will not have a significant impact on fishing.

J. STREAM MODIFICATION OR IMPOUNDMENT

The proposed project does not contemplate the impoundment of any water body. However, it will modify slightly the present alignment of the Martin Pena Channel with the proposed channelization. As it can be seen in Appendix C, with the construction of the project there will be an increase in the streambed depth and elimination of sandbars that have been created by the deposition of sediments. Stream modification will be beneficial in increasing the tidal induced flow into the channel. The velocity of the water in the channel will not be altered.

K. FLOODPLAINS

No impact on the floodplain area due to the project is expected. The construction of a channel with bulkhead structures along the channel will allow water runoff into the channel. Since the water levels will remain as they are at present time, the water velocity on the channel will not be increased and although some increase in channel capacity will be provided, the project is not expected to help reduce or solve the floodplain problems in the area.

The Hato Rey Terminal site will be built in an area that is considered floodable. Under present regulations, construction is permitted in this site provided that the structures be designed in accordance to Regulation No. 13 of the Puerto Rico Planning Board.

Adequate drainage structures will be provided for the busway and terminal.

L. PRIME AND UNIQUE FARMLANDS

There are no prime or unique farmlands at or near the project areas.

M. COASTAL ZONE

The impacts on the coastal zone are the same as the impacts discussed in the other sections of this document. The Coastal Zone Management Plan requires consistency of federally funded activities with the plan. In determining federal consistency, the following standards shall be applied:

- (1) The objectives and policies elements of the Islandwide Land Use Plan adopted by the Puerto Rico Planning Board. The project is included in that Land Use Plan.
- (2) Policy on special protection for mangrove wetlands.
- (3) Criteria for diking, filling, dredging and deposit of dredged sediments.
- (4) Water Quality standards adopted by the Puerto Rico Environmental Quality Board.
- (5) Any additional policies, regulations and plans including plans for Special Planning Areas or Natural Reserves.

The project is consistent with the Coastal Zone Management Plan for Puerto Rico. The following reasons sustain this conclusion:

- (1) The project will improve the quality of the water in the channel which nourishes the mangroves, aiding in the restoration of these species.
- (2) The project preserves the mangrove community as far as possible.
- (3) The project is deemed to be in the general welfare of the public.
- (4) The project does not contribute to flooding in the area.
- (5) The project does not have a significant impact on the wildlife and endangered species in the area. Although it will destroy areas of mudflats in the channel, restoration and creation of additional areas for wildlife will be undertaken. The principal habitat for the endangered species in the area is the mangrove peninsula at the entrance of the channel which will not be disturbed.
- (6) The project will improve the conditions of the estuary at the entrance of the Martin Pena Channel.
- (7) Dredging in the Martin Pena Channel is compatible with the criteria set forth in the plan.

N. HISTORICAL SITES

There are no historical or archeologically significant sites in the area where work is required. Nevertheless, in the event that such a site is discovered during construction, the contractor will halt the work until salvage operations are undertaken. Coordination with the State Historic Preservation Officer is being undertaken.

O. RELATED MAJOR PROJECTS

Two major projects are closely related to the Agua - Guagua Project and have been discussed earlier in this document including:

1. The Land Use Plan for the Martin Pena Channel
2. The Development of New Center

Two additional projects do not affect this project but their proximity and similarity of impacts may make their impacts cumulative. These Corps of Engineers projects are: 1) The proposed improvements to San Juan Harbor, and 2) the channelization of the Rio Piedras.

CHAPTER V

COORDINATION AND COMMENTS

The participation of the general public and government agencies (local, state and federal) was requested from the early stages of the development of the proposed project.

A public hearing was held on March 5, 1981, as required for the application requesting a federal grant for the construction of the project.

Two scoping meetings were held on September 15 and 16 of 1982, as part of the preparation of the Draft EIS. On May 13, 1983, the Draft EIS was distributed to federal, state and local agencies.

On June 20, 1983, two public hearings were held, where all alternatives were discussed and analyzed with the public and government agencies.

Since then, several meetings have been held with the purpose of requesting technical information and coordination with concerned agencies, such as, P.R. Department of Natural Resources, U.S. Corps of Engineers, U.S. Fish and Wildlife Service and P.R. Port Authority.

The following is a discussion of the comments from the public hearings and from letters received:

A. PUBLIC HEARINGS

1. Comment:

An official from the P.R. Department of Commerce requested information regarding the businesses that could be affected by the busway alternatives in order to give their comments.

Response:

The information was sent to the Department of Commerce and their comments are discussed later in this chapter.

2. Comment:

A citizen is aware of the archaeological resources of the area and asked if an archaeological study was considered. Also, he is concerned about the accessibility of the Hato Rey Multimodal terminal for the people living some distance from the terminal with no bus routes to Hato Rey.

Response:

An archaeological survey was not performed since there were no significant historical or prehistorical occupations in the area. But if precolombian or historical sites are found during construction all activities will stop and contact will be made with the State Historic Preservation Officer to conduct salvage operations if needed.

In relation to the accessibility of the Multimodal Terminal to people from distant points, that will depend upon how the Metropolitan Bus Authority adjusts its existing bus routes. However, the Hato Rey area is currently one of the areas best served by bus routes.

3. Comment:

A citizen asked about the tourist potential of the waterway, if it has been considered during the project development.

Response:

No special consideration was made regarding the tourist potential of the waterway, but if the government has interest in developing the Martin Pena area as a tourist attraction the proposed project will be a helpful means to achieve such a goal.

4. Comment:

Has coordination been made with the Department of Natural Resources regarding the Rio Puerto Nuevo flood control project? Will the operation of the project be self supporting?

Response:

The necessary coordination has been made with the Department of Natural Resources. We do not have enough data to accurately predict whether the project will be self supporting. Preliminary information indicates that the project will cover a greater part of its operating costs from operating revenue than existing bus and ferry services.

B. LETTERS FROM FEDERAL AGENCIES

U.S. Department of the Interior

1. Comment:

We consider the mangrove loss of a magnitude to warrant a mangrove revegetation program. With proper site preparation, natural revegetation can be as effective as mangrove plantings. There are at least two sites that could be used; the Barriada Tokio residential area and at the mouth of Tres Monjitas Channel.

Response:

Ecological mitigation measures for the preferred alternative are presented in Section IV.G.3, including mangrove revegetation and mudflat creation.

2. Comment:

The effects of dikes or bulkheads on sheet flow water circulation in the mangroves have not been addressed. The structures could cause ponding and cutoff mangroves from tidal flow, thereby reducing long term survival of mangroves.

Response:

The bulkheads will be designed in order to properly allow the tidal flow into mangroves.

3. Comment:

The two tracts of mangroves extending into San Juan Bay downstream of the Constitution Bridge are the most important roosting sites for the endangered yellow-shouldered blackbird (*Agelaius xanthomus*) and brown pelican (*Pelecanus occidentalis*). An alternative to reduce impact would be a channel with a 100-foot wide bulkhead, downstream of Constitution Bridge, while providing two-way ferry traffic in a 180 foot-wide channel upstream of the bridge.

Response:

The preferred alternative requires the taking of only 0.90 acres of mangrove downstream of Constitution Bridge. Considering the total area of mangrove in the area, 198 acres, and the proposed revegetation and mudflat creation, we consider the reduction of the channel width in this segment unnecessary.

4. Comment:

Section II.B.1, paragraph 5 - Dike System. Provisions for tidal flow in and out of the mangroves and sheet flow from runoff can be improved by alternating the elevation of the panels between the pilings.

Response:

See Section II.B.1, paragraph 5, sentences 5 and 6.

5. Comment:

Pages 75-76 - Impacts. Alternative 2 would produce positive benefits through tidal flushing. The other plans would result in net losses, with diking causing the most severe effects.

Response:

The preferred Alternative 5 will also provide for tidal flushing.

6. Comment:

Page 76 - Mitigation Measures. We do not agree that Alternatives 2 and 5 would cause minimal mangrove losses. Sites for mangrove mitigation should be designated in the revised DEIS. Mudflat sites (Figure 12) need more study for suitability to accomplish mitigation.

Response:

Mangrove losses due to the preferred alternative will be compensated (See Section IV.G.3). The site shown in Figure 12 for mudflat creation is only a possibility as earlier discussed with officials of U.S. FWS and the Department of Natural Resources. Indeed, it requires further study.

7. Comment:

Page 79 - Endangered Species. The statement about mudflats is in conflict with information on Page 34. Feeding and roosting areas are essential habitat components for the endangered species. Table 20 information does not support the contention that mudflats alone would be adequate mitigation.

Response

See Section IV.G.4, paragraph 2.

U.S. Department of Housing and Urban Development

1. Comment:

Five (5) HUD aided housing developments may be affected by the proposed project. San Juan Park may be affected by dredging operations and La Morada, Jardines de Cuenca, San Juan Tower and Egida Colegio de Abogados may be affected by increases in noise levels.

Response:

We want to state clearly that no housing development will be affected by the dredging operations for the waterway. Regarding the noise levels in the project area our studies reveal that, as it is illustrated in Table 13, the increase will be of only one (1) DBA, which is not significant.

2. Comment:

The EIS must be improved by including a summary of the relocation plan for Barriada Tokio.

Response:

A summary of the relocation plan is included in the text of this document (Section IV.B.2).

U.S. Department of Agriculture-Soil Conservation Service

1. Comment:

Erosion will be generated by vessel wakes along the navigational channel sideslopes and runoff water entering the channel. This will cause sedimentation and debris accumulation that will have to be dredged through a maintenance program. Dredged material should be analyzed and disposed in a safe and adequate site.

Response:

Erosion during the operation of the project will be minimized by the implementation of the recommended alternative for the waterway. Sideslopes of the channel will be protected by the construction of a bulkhead. Also, the vessel design criteria states that the wake action in the channel will not exceed one foot. In addition, some preventive maintenance measures will be taken during design and construction, for example, the construction of sedimentation basins in those areas where it is expected that sedimentation problems may occur. Two sites have been identified, and they are the Munoz Rivera and Ponce de Leon Bridges, where the new channel conditions will meet the existing channel conditions, and the intersection of the Puerto Nuevo River with the Martin Pena Channel.

A maintenance program will be enforced during the operation of the project. The material to be dredged will be disposed in accordance with the regulations of the P.R. Environmental Quality Board.

2. Comment:

Material obtained from the construction activities should be disposed of at safe sites. Disturbed areas should be properly stabilized. Sediment and erosion control plan should be prepared.

Response:

The dredge material, as it is planned, will be disposed in the ocean. We have prepared the required technical reports in order to obtain an ocean dumping permit. A sediment and erosion control plan will be prepared by our waterway design consultant, the U.S. Corps of Engineers, which will be included in the construction plan.

U.S. Coast Guard

1. Comment:

Coast Guard is recommending the use of the Computer Assisted Operations Research Facility (CAORF) of the Maritime Administration for the project development. Contact should be initiated with the Coast Guard to develop the proper bouyage system.

Response:

The information submitted by the Coast Guard in relation to CAORF and for the coordination in relation to the bouyage system will be given to the Corps of Engineers, our waterway design consultant, to be taken in consideration in final design.

U.S. Fish and Wildlife Service

1. Comment:

How was it detemined that the project would not affect endangered species when loss of mangrove habitat of from 1.73 to 40.21 acres would result, depending on the selected alternative? The DEIS states only that the yellow-shouldered blackbird has been observed in the area. We believe that additional information is needed in order to assess the potential impact of the project on this species.

Response:

The Brown Pelicans use the mangrove for roosting only and they feed in openwater on the bay. The preferred alternative will take only about 6 acres out of a 200 acre mangrove forest. In addition, over 7 acres of mangroves will be planted in the vicinity of the Tres Monjitas Drainage Channel and additional acres of mangroves will result as existing mangroves extend up to the bulkhead. In relation with the yellow-shouldered blackbird we want to establish that it has been reported in areas near the mangrove forest, but their presence in the mangroves along the channel was not confirmed during the survey conducted for this study. Therefore, since this project will result in a net increase in mangroves, the endangered species will not be affected.

2. Comment:

There is no consistency between the statement of no effect on endangered species on Page 79 and the matrix on Page 77 that indicates the impact on those species.

Response:

The matrix on Page 77 considers the impacts of the project if no mitigation measures are taken. But, as we are going to implement mitigation measures, the impacts will not be significant.

Federal Highway Administration

1. Comment:

An exclusive roadway other than Chardon Street for the busway would be most desirable in moving passengers to and from the terminal and would assist in securing efficient operation of this link in the proposed system.

Response:

The preferred alternative for the busway is Alternative 1, which will use the proposed metro right-of-way. This alternative will provide for an exclusive busway through the Nuevo Centro area, and taking out the buses from the already congested streets.

2. Comment:

The feasibility of removing the concrete sideslopes under the Kalaf Street Bridge of Las Americas Freeway should be investigated before a final commitment is made. From Alternative 1 description it seems that it is intended to have mixed traffic along Kalaf Street.

Response:

All investigation necessary to make the determination of removing the concrete sideslope under the Kalaf Street Bridge will be performed. That includes structural analysis, as well as soil studies.

Regarding the mixed traffic condition on Kalaf Street for the bus route in Alternative 1, we want state that the purpose is to maintain that condition.

3. Comment:

A parking alternate close to the proposed Hato Rey Terminal is desirable.

Response:

We agree that a parking alternate close to the Hato Rey Terminal is desirable. However, due to the space limitation in the adjacent areas, it was decided to take advantage of the available parking lots in the Roberto Clemente/Hiram Bithorn sports complex by providing the proposed busway feeder service.

4. Comment:

It would be desirable to have the completed freeway system in the vicinity of the proposed project in all maps and figures. Only part of the completed system is shown. In this manner there is a better perspective of the project impact areas with respect to the completed transportation system.

Response:

Figures 1, 3 and 11 show the completed highway system in the vicinity of the proposed project. We consider that a good perspective of the project impact areas with respect to the completed transportation system is presented in the document.

Environmental Protection Agency

1. Comment:

Implementation of Alternatives 3, 4 and 6 will result in the loss of large acreage of mangroves in an area which now constitutes the last large wetland area in Metropolitan San Juan. Mitigation for such a loss was not specially addressed in the DEIS except for a possible location for a mudflat creation project. We are unconvinced that large scale mitigation such as this could be successful and we would prefer to see another alternative designated as part of the selected plan.

Response:

The preferred alternative (number 5) requires the elimination of only 6.36 acres of mangroves, what can not be considered a significant loss if it is realized that there are about 198 acres of mangroves in the area. Notwithstanding over 6 acres mangrove planting alongside the Tres Monjitas Channel has been included as part of the ecological mitigating measures in Section II.G.3. In addition, we expect that bulkheads will facilitate the eventual spreading of mangroves up to the edge of the proposed channel (See Section IV.G.3).

2. Comment:

We do not believe that riveted dikes or bulkheads are necessary for protecting mangroves and mudflats which are habitats that are highly resistant to erosion. The installation of such devices could also have the undesirable impact of reducing the existing sheet flow through the mangroves and mudflats, thus reducing the purifying effect that this flow achieves.

Response:

Regardless the need of bulkheads as an erosion control measure, such device is necessary in order to minimize mangroves and mudflats taking. Alternatives without bulkheads require a considerable additional width in order to have stable slopes of 10:1. The proposed bulkheads will be designed so as to allow tidal and sheet flow through the mangroves and mudflats.

3. Comment:

We believe that Alternative 1 provides the most environmentally acceptable alternative for the waterway aspect of the project, however we are concerned that mitigation efforts have only been proposed for Alternatives 3, 4 and 6. We believe that mitigating for Alternative 1 is environmentally justified and we would recommend that mitigation for this alternative, should it be selected, be provided in the FEIS.

Response:

We feel that your preference of Alternative 1 over Alternatives 2 and 5 is based on the wrong appreciation that bulkheads will reduce existing flow through the mangroves and mudflats. We believe that Alternative 5 is the one that better meets environmental and service goals, and as the preferred waterway alternative, mitigation measures included in the FEIS are proposed for this alternative.

4. Comment:

The disposal of the material to be dredged from the channels will either be disposed of at upland sites or ocean dumping, however the DEIS does not provide an analysis of the sediment to be dredged.

Response:

Two kind of sediments analyses were conducted. A detailed discussion of the nature of the analyses and the results is included in the technical reports Bioassay and Chemical Analyses of Dredged Material - Martin Pena Canal, Puerto Rico, and Agua-Guagua Project Benthic Sludge/Soil Analyses. A summary of the results is also included as part of this FEIS in Section IV.I. Copy of these reports will be sent to EPA as part of the requesting of an Ocean Dumping Permit.

5. Comment:

We believe that for the ocean dumping alternative, the size of the area that was predicted for receiving the dredged material may be underestimated.

Response:

The 5,000 square foot area indicated in the EIS was obtained by a very rough calculation. A more accurate calculation will be made prior to the application for the Ocean Dumping Permit.

6. Comment:

On Page 4, issuance of Section 103, Ocean Dumping Permit is mistakenly attributed to EPA. The Corps of Engineers issues these permits, while EPA provide an independent analysis of the dredge material in compliance with its marine environmental impact criteria, issued pursuant to the Marine Protection Research and Sanctuaries Act.

Response:

Your clarification on this subject is welcome. As mentioned in the response to your comment number 5, copy of the technical reports on sediment analysis will be provided to you when the permit is requested from the Corps of Engineers.

7. Comment:

We are aware of at least two other major projects in the San Juan area which will be destroying mangrove habitat and which are looking into suitable areas for mangrove mitigation: the Baldorioty de Castro Highway Improvement Project and the Rio Piedras Flood Control Project. The cumulative effect on the San Juan area mangrove system needs to be addressed. There are not very many area suitable for mangrove mitigation in the area. Thus, there may be significant inter-project competition for the same sites.

Response:

The 6 acres to be taken by the preferred alternative and 7 acres of mangroves to be planted as a mitigation measure for this project is so little an area that we consider the recommended analysis unnecessary. The proposed compensation for mangrove loss also makes the analysis of cumulative effects unnecessary.

8. Comment:

A potential for secondary wetland impact also appears to exist. The new and improved waterfront ferry terminal may generate adjacent retail and service businesses which might require wetland fillings for site preparation. Also, the improved Martin Pena Channel might encourage other port interests to now locate their facilities along the channel.

Response:

The development of the areas adjacent to the proposed terminal is already in the Plan for the Development of the Martin Pena Channel and the Plan for the Development of the New Center of San Juan. Therefore, these developments could not be considered a consequence of the proposed Agua-Guagua Project. We do not believe that a channel 180 foot wide and 10 foot deep may encourage other port interests to locate their facilities along it.

Department of Health and Human Services

1. Comment:

The final EIS should state which are the preferred alternatives for the waterway, the terminal location, and the busway, as well as the preferred alternative for the disposal of dredged material from the waterway.

Response:

The preferred alternatives for the waterway, the busway and the terminal location are identified in Section II.C. The preferred alternative for the disposal of dredged material is identified in Section IV.I, paragraph 4.

2. Comment:

It was noted that the upland disposal alternative did not address potential vector problems from mosquito populations. Dredged spoil areas can be a source of mosquito breeding. If this alternative were selected, what mosquito control measures would be employed?

Response:

The ocean disposal alternative is much less costly while having less environment impacts than upland disposal. Therefore, the former is the preferred alternative, and we consider the discussion about mosquito control measures unnecessary.

3. Comment:

The EIS shows a 100-year storm flood level map and indicates the Hato Rey Terminal would be on a Zone 2 classification, based on Regulation Thirteen of the Puerto Rico Planning Board. The meaning of this classification and its relationship to flood safety is not clear.

Response:

Regulation thirteen of the Puerto Rico Planning Board classifies floodable areas into zones where construction of structures is not allowed and zones where construction of structures is allowed, but in compliance with the requirements set in their own Regulations for such structures in order to avoid flood hazards.

C. LETTERS FROM COMMONWEALTH AGENCIES

Environmental Quality Board

1. Comment:

The alternative to be selected could eliminate around 40 acres of mangrove.

Response:

The preferred waterway Alternative 5 requires the elimination of only 6.36 acres of mangrove.

2. Comment:

The mangrove elimination will reduce feeding, roosting and nesting for many bird species including two endangered species, and four rare species protected by federal laws.

Response:

Mangrove elimination will be compensated. See Section IV.G.3.

3. Comment:

The experimental fish capture conducted on December, 1982, seems to be conducted during only one day. It could not be representative.

Response:

The existing anaerobic conditions of the water at the Martin Pena Channel are well known by the Environmental Quality Board. Regardless, the results of the experimental capture, the dredging of the channel and the relocation of Barrio Tokio will improve the BOD, increasing the opportunities for fish life.

4. Comment:

The socio-economic impact of relocating Barriada Tokio is not discussed.

Response:

The socio-economic impact of relocating Barrio Tokio has been discussed in the Final EIS. See Section IV.B.2.

5. Comment:

The Draft EIS does not discuss other feasible alternatives for the transportation problem solution.

Response:

There are three possible mass transit alternatives between Hato Rey and Old San Juan: metro, buses and ferry. No federal funds will be available for fixed-way projects, and MBA existing bus service has not been capable of solving the transportation problems. Therefore, the only choice was the ferry system.

6. Comment:

The document does not present clearly and concisely the possible environmental impact on the waters. It is not specified if there will be sewer services, chemical wastes, fuel storage tanks or any other chemical substance, so as everything that related to the water quality and the measures to protect them.

Response:

Section IV-H discusses the project impact on water quality during its construction and operation. Indeed, the intermodal terminal in Hato Rey will be provided of sewer services, since it will be connected to the sewer system in the area will not affect the water quality. No significant chemical wastes will be produced due to the project. The vessels maintenance will be performed in the sites presently available for these activities within the ports facilities. It is unknown at this time if there will be fuel tanks in the proposed terminal, but if that is the case, applicable safety and environmental ruling will be complied in order to avoid accidents.

7. Comment:

On Page 56 it is pointed out that the channel construction will improve the water conditions and will help to lessen its degradation. It is noted also that the ecology of the area will be benefited for a reduction on nutrients overload and excessive sedimentation.

- a) It is understood that the only thing that will really eliminate the water degradation in the channel will be the pollution sources stopping that are primarily the sewerless residential sectors alongside the channel.
- b) The document itself mentions the fact that the mangrove ecosystem help to stop sedimentation and put aside nutrients overload, while the proposed project will eliminate from 1.73 to 40.21 acres, depending on the selected alternative.

Response:

- a) The channel dredging will dispose of highly polluted benthic sludges, improving the existing water quality. In addition, the project proposes the relocation of the largely sewerless slum alongside the channel, Barrio Tokio. As set in the document, maintenance dredging will be observed in order to dispose of material carried by existing drainage canals entering the channel and from the easterly portion of the channel.
- b) For the reasons set above, the nutrient overload and excessive sedimentation will be reduced. It is true that the existing mangroves help in that sense. However, the elimination of a narrow fringe of mangrove trees close to the channel will not lessen its capability to reduce the nutrient overload and excessive sedimentation, especially since other mangroves would be grown as a mitigation measure.

8. Comment:

On Page 77, Table 20 should have indicated that food chains are affected by the other two activities, and if the other parameters are altered, the chains will be affected also.

Response:

Section IV.G.1 contains a discussion on that subject.

Department of Natural Resources

Comment:

The mangroves at the mudflats near the Constitution Bridge must be preserved due to the abundant aquatic life.

Response:

The final design for the waterway will take in consideration all possible measures to mitigate or minimize adverse impacts in that particular area. But more important than that is the relation of our project with other agency projects in the same area. For example, the Department of Natural Resources is planning to construct flood control measures for the Puerto Nuevo River. That action includes a channel more than 550 feet wide in the same location of our waterway in the vicinity of the Constitution Bridge. That action will affect directly any mitigation measure taken by us, and will practically eliminate the mangroves and the mudflat area. Furthermore, our project will be coordinated with the Department of Natural Resources in order to develop a final design that is compatible with that agency's goals.

Institute of Puerto Rican Culture

Comment:

Since there were no historical or prehistorical significant occupations in the area, there will not be any inconvenience regarding the project. If pre-colombian or historic sites are discovered, please stop construction at once and contact the State Preservation Officer.

Response:

It is our commitment to proceed according to your recommendation if pre-colombian or historic artifacts are found during the construction activities.

Solid Waste Management Authority

Comment:

Regarding the disposal of the dredge material they are in favor of the ocean dumping alternative, because it will not have adverse impact.

Response:

No comment.

The New Center of San Juan Corporation

Comment:

The New Center Corporation gives a completed endorsement to the Agua-Guagua Project. They recommend Alternative 2 for the busway and Alternative 3 for the terminal location.

Response:

No comment.

Puerto Rico Department of Commerce

1. Comment:

Department of Commerce endorses Alternatives 1, 3 and 4 for the busway.

Response:

Alternative 1 is our preferred.

2. Comment:

A parking lot should be provided in the vicinity of the Hato Rey Terminal site. Parking facilities should be provided at the old MBA facilities.

Response:

See response to Comment 3 from FHWA.

Puerto Rico Tourism Company

Comment:

The project will benefit the transportation in the San Juan Metropolitan Area. The project will provide our citizens and visitors with additional recreational activities.

Response:

No comment.

Puerto Rico Industrial Development Company

Comment:

PRIDCO considers that Alternative 1 for the busway is the most convenient. The project will benefit the workers in the Tres Monjitas area.

Response:

No comment.

Metropolitan Bus Authority

1. Comment:

The MBA recommends Alternative 2 for the busway, and additional operational analysis for the bus service.

Response:

As stated in the description of the preferred alternative the busway through the Metro right-of-way was recommended based on operational considerations. That alternative (number 1) will provide an exclusive busway that will reduce the operating cost and travel time. If Alternative 2 is implemented, the mixed traffic of buses and cars will increase significantly as soon as Arterial B is constructed because it will serve as an east-west alternate to the heavily congested Roosevelt Avenue and Chardon Street, affecting the mixed traffic busway service through this arterial.

2. Comment:

The busway alternative to be selected must consider MBA existing bus routes, ability to modify those routes, connection of bus routes with the terminal and exclusive facilities for buses.

Response:

Close coordination will be made with the MBA for the further development of the project, but already we are recommending the alternative which best fits the exclusive facility criteria, that is an exclusive busway.

3. Comment:

The terminal location must be one that will permit MBA to easily modify their existing bus routes. Also, the terminal must be adjusted to the operational conditions of the MBA.

Response:

Our terminal facility consultant will consider all those aspects arose by MBA, and will establish a close coordination with MBA in order to select the best terminal location.

Puerto Rico Housing Department

Comment:

Page 26 of the EIS, Section C, about terminals, indicates that families from Barrio Tokio are presently being relocated as part of the development of the New Center of San Juan and the development of Martin Pena Channel. While Page 50 indicates that the Barrio will be relocated as part of the plan for the development of the proposed Agua-Guagua Project. In any case, we have not received the socio-economic study and the Relocation Plan.

Response:

See Section IV.B.2, Paragraph 1, for the clarification of this subject. The socio-economic impact of relocating Barrio Tokio has been included as part of this FEIS (Section IV.B.2). A Relocation Plan was prepared by the Municipality of San Juan and approved by the Urban Mass Transportation Administration.

D. LETTERS FROM MUNICIPALITIES

Municipality of San Juan

Comment:

The document cover all aspects to be considered in the determination of the project impacts.

Response:

No comment.

E. LETTERS FROM CITIZENS AND PRIVATE ORGANIZATIONS

Ariel Lugo - Citizen

1. Comment:

Suggests experiment with the construction of mudflats before destroying existing mudflats.

Response:

Mudflats construction mitigating measures requires further studies before its implementation. If the mudflats will be constructed before or after the channel dredging is one of the things to be evaluated.

2. Comment:

Suggest the reduction of the channel width to 80 feet in order to minimize damage to wetlands.

Response:

Vessel handling and maneuvering criteria requires a channel 180 foot wide minimum for two-way traffic. This was established in the preliminary engineering report. See the warning of the Coast Guard letter in relation to this matter. The necessity of having two-way traffic is discussed in Section II.B.1.

3. Comment:

Suggests submerged bulkheads on the sides of the channel in order to allow water exchange with wetlands.

Response:

The proposed bulkheads system will be designed in order to allow water exchange with wetlands.

4. Comment:

The channelization of the Cano Martin Pena could create serious water quality problems downstream particularly in the San Juan Bay. The DEIS does not contain a single analysis of sediment chemistry.

Response:

The water quality impact of the project and recommended mitigation measures are discussed in Section IV.H of the EIS. Sophisticated analysis of sediment chemistry have been performed during the environmental process for this project. A summary of the results of such analysis is included in Section IV.I of the EIS. Two technical reports were prepared which explained in detail the analytical methodology and the results. Those reports are available for inspection by the public upon request.

5. Comment:

On Page 2, planned future developments along the canal and rights-of-way of the proposed terminal for rapid traffic construction are mentioned, but not discussed because they are not part of this proposed action. On Page 26, future terminals are mentioned. All proposed developments along the canal, which are bound to be very harmful to the mangrove and other wetlands in the area, must be discussed as part of this proposal.

Response:

The environmental impact of developments which are only a possibility can not be addressed as part of this EIS. Future terminals could be not needed in the future. The information needed for the environmental assessment of such future projects has not yet developed.

6. Comment:

On Pages 41, 44 and 45, the drafters of the EIS discuss the role of algae in terms of environmental quality. All these discussions are factually wrong in the sense that they picture algae and other aquatic life as causers of pollution and even indicate that plant photosynthesis causes pollution because it changes the pH and alkalinity of the water.

Response:

We simply recommend to the commentator a thorough reading of those referred pages. There is nothing inaccurate in these discussions. A reading of the following two paragraphs should be convincing.

"Algae have positive and negative effects upon the quality of the surface water. The positive effect is the oxygen production by photosynthesis; the negative is the organic matter residue left by dead algae. Decomposition of this residue exerts a significant oxygen demand. Uncontrolled algae growth on the surface may also interfere with oxygen transfer from the atmosphere. Algae also use up some oxygen during respiration. The net result, however is a very good oxygen production from algae".

"PH in Martin Pena Channel is over 8.5 because of the impact of water from San Jose Lagoon with high pH. In addition, anaerobic digestion of the benthic deposits existing in the channel produce alkalinity which raises pH, and the dissolved carbon dioxide withdrawn from the water during photosynthesis also raises the pH to some extent".

7. Comment:

On Page 55, a paragraph is dedicated to community cohesion. Nothing is said of community dislocation in terms of all the displaced families and businesses that will result from the project.

Response:

See Sections IV.B.2 and 3, where the impact of relocating Barrio Tokio is discussed.

8. Comment:

If the mudflats are declared a natural reserve in the Coastal Zone Management Plan (p. 46) while this DEIS indicates that two mudflats will be eliminated (p. 77), how can the DEIS be consistent with the Coastal Zone Management Plan?

Response:

Because mudflats will be constructed to compensate for the mudflats to be eliminated, the proposed project is consistent with the Coastal Zone Management Plan.

9. Comment:

How will the project improve on water quality (p. 56)? How will the project have long-term beneficial impacts on wetlands that are now doing fine without the project (p. 75)?

Response:

See the response to Comment 6 of the Environmental Quality Board.

Mr. Frank O. Inserni - Citizen

1. Comment:

No consideration has been given to bicyclists and pedestrians in the project development. The plans must be revised to take bicyclist and pedestrians needs into account.

Response:

The plans for the project are at present in a very preliminary stage, but consideration will be given to Mr. Inserni recommendation for bicyclists and pedestrians. Studies will be performed in relation to the possibility of providing bicyclist facilities at the terminals and vessels.

Old San Juan Businessman's Association

1. Comment:

Endorsement is given to the waterway but not to the bus routes. They preferred bus routes along Rio Piedras-Santurce line. Plaza Las Americas is already adequately served by transportation modes.

Response:

The Rio Piedras-Santurce routes will be benefited by this project because the Hato Rey Terminal (any of the location alternatives) will be located within easy walking distance. Also, the MBA should modify some existing bus routes in order to provide a better bus service through the Hato Rey Terminal.

2. Comment:

The waterway should be extended up to the San Jose Lagoon.

Response:

It is the Department of Transportation and Public Works intention to provide that service in the future, but the availability of funds compel us to construct the project as it is described in this document.

LIST OF PREPARERS

Department of Transportation and Public Works of Puerto Rico - Environmental Studies Division

1. Eng. Nestor Quevedo Cordero - Chief
2. Eng. Joaquin Crespo Moyet - Project Manager
3. Eng. Jorge Rivera Jimenez - Environmental Engineer
4. Mr. Antonio R. Gordo Batista - Environmental Technician
5. Ms. Wilma Marrero Santini - Socio-Economic Planner

Urban Mass Transportation Administration

1. Mr. Kenneth U. Mowll - Community Planner

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Municipalities

San Juan

Catano

APPENDIX A
FLORA-FAUNA INVENTORY

Table A-1 Animals of Martín Peña Channel and Their Habitat Preferences

B - Breeding
 F - Feeding on Foraging
 R - Roosting on Resting

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Water	
					Bay	Estuary
Birds 1						
Brown Pelican C, E	F-R				F-R	F-R
Magnificent Frigatebird C	R				F	F
Great Blue Heron Uc	B-F-R				F	F
Green Heron C	B-F-R	F-R			F	F
Little Blue Heron C	B-F-R	F-R			F	F
Cattle Egret C	B-R		F			
Reddish Egret * A	B-F-R	F-R		F-R		F
Great Egret C	B-F-R	F-R		F-R		F
Snowy Egret C	B-F-R	F-R		F-R		F
Louisiana Heron C	B-F-R	F-R		F-R		F
Yellow-crowned Night Heron C	B-F-R	F-R		F-R		F
Least Bittern R	B-F-R	F-R		F-R		F
White Ibis * A	F-R	F-R		F-R		F-R

(Cont.)

Table A-1 (Cont.) (2)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Bay	Water Estuary
White-checked Pintail * A						F-R
Blue-winged Teal * A						F-R
Buteo jamaicensis ** Uc	F-R		F			
Osprey ** C	R				F	F
Sparrow Hawk or American Kestrel ** Uc	B-F-R		B-R			
Clapper Rail C	B-F-R	F-R				F-R
Common Gallinule C	B-F-R	B-F-R				F-R
Killdeer C						F-R
Semipalmated Plover C						F-R
Snowy Plover Uc						F-R
Wilson's Plover Uc						F-R
Lesser Golden Plover Uc						F-R
Black-bellied Plover C						F-R
Ruddy Turnstone C						F-R
Common Snipe ** R						

(Cont.)

Table A-1 (Cont.) (3)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Water Bay	Open Water Estuary
Whimbrel Uc				F-R		
Spotted Sandpiper C				F-R		
Greater Yellowlegs C				F-R		
Lesser Yellowlegs C				F-R		
Willet Uc				F-R		
Red Knot R				F-R		
Pectoral Sandpiper R				F-R		
Least Sandpiper Uc				F-R		
White-rumped Sandpiper Uc				F-R		
Dunlin * A				F-R		
Semipalmated Sandpiper C				F-R		
Western Sandpiper C				F-R		
Sanderling Uc				F-R		
Short-billed Dowitcher C				F-R		
Long-billed Dowitcher ** R				F-R		
Stilt Sandpiper C				F-R		

(Cont.)

Table A-1 (Cont.) (4)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Water Bay	Open Water Estuary
Hudsonian Godwit * A				F-R		
Black-necked Stilt C				F-R		
Greater Black-backed Gull R					F-R	F-R
Lesser Black-backed Gull ** A					F-R	F-R
Herring Gull Uc					F-R	F-R
Ring-billed Gull * C					F-R	F-R
Laughing Gull C					F-R	F-R
Black-headed Tern R					F-R	F-R
Franklin's Gull * R					F-R	F-R
Gull billed Tern Uc					F-R	F-R
Forster's Tern * A				R	F	F
Common Tern C				R	F	F
Roseate Tern * Uc				R	F	F
Little Tern * Uc				R	F	F
Royal Tern C				R	F	F
Cayenne Tern * R				R	F	F

(Cont.)

Table A-1 (Cont.) (5)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Bay	Open Water Estuary
Sandwich Tern C				R	F	F
Caspian Tern Uc				R	F	F
Black Tern R				R	F	F
Black Skimmer * A				R	F	F
Zenaida Dove Uc	B-F-R		F-R			
White-winged Dove Uc	B-F-R		F-R			
Ground Dove C	B-F-R		F-R			
Rock Dove ** Uc	F		F			
Monk Parakeet ** R	B-F-R		F			
Smooth-billed Ani C	B-F-R					
Antillean Mango Hummingbird ** R	B-F-R					
Belted Kingfisher C	R					
Gray Kingbird C	F-R		B-F-R			
Cave Swallow C			B-F-R			
Caribbean Martin * R					F	F
Bananaquit ** C	B-F-R		B-F-R			

(Cont.)

Table A-1 (Cont.) (6)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Water Bay	Estuary
Northern Panula Warbler ** C	B-F-R					
Yellow Warbler C	B-F-R					
Prairie Warbler ** C	F-R					
Black and White Warbler ** C	F-R					
Northern Waterthrush ** C	B-F-R	F-R				
Ovenbird ** Uc	F-R					
American Redstar ** C	B-F-R					
Orange-checked Waxbill C			B-F-R			
Red Munia or Strawberry Finch C			F-R			
Bronze Munia C			F-R			
Spotted Munia ** C			F-R			
Java Sparrow ** C			F-R			
Greater Antillean Grackle C	B-F-R		F-R			
Yellow-shouldered Blackbird *R,E	F-R		F-R			
Glossy Cowbird ** Uc	F-R		F-R			
Black-faced Grassquit C	B-F-R		B-F-R			

(Cont.)

Table A-1 (Cont.) (7)

Animals	Mangrove Swamp	Swampy Savanna	Filled and Upland Areas	Mudflats	Open Water Bay	Open Water Estuary
<u>Mammals</u>						
Black Rat	x		x			
Mongoose	x		x			
<u>Reptiles and Amphibians</u>						
Common Anoles	x	x				
White-lipped Frog	x	x				
Coqui Frogs	x		x			
<u>Fish</u>						
Tarpon						x
Guppy						x
Common Snook						x
Irish Mojarra						x
Romboid Mojarra						x
Ground Drummer						x
Tilapia						x
Spanish Sardine					x	

(Cont.)

Table A-1 (Cont.) (8)

Animals	Mangrove Swamp	Swampy Savanna	Filled Upland Areas	Mudflats	Open Water Bay	Open Water Estuary
<u>Fish (Cont.)</u>						
Atlantic Thread Herring					x	
White Mullet					x	
Liza					x	
Sea Bream						x
<u>Crustaceans</u>						
Land Crab	x	x	x	x		
Fiddler Crab	x	x			x	x
Blue Crab	x					
Rock Crab					x	
Aerial Tree Crab	x					
Red Mangrove Crab	x					

1/From: Critical Wildlife Areas of Puerto Rico, Resources Planning Area, Coastal Zone and Wildlife Planning Division, Department of Natural Resources. 1979.

*The species marked with an asterisk have not been confirmed during this study.
 **Those double marked are additions.

The present status of them is given by the following code: C - Common, Uc - Uncommon, R - Rare, A - Accidental, E - Endangered (Endangered Species Act 1973, U.S. Dept. of the Interior, Fish and Wildlife Service.

Table A-2 Experimental Capture of Fish in Martín Peña Channel

Species (Numbers)	Near Station 1	Distance from San Juan Bay		
		Station 2	Station 3	Far Station 4
Tarpon (4)				x
Guppy (11)			x	
Common Snook (4)				x
Irish Mojarra (6)	x	x		
Rhomboid Mojarra (5)	x	x		
Ground Drummer (1)				x
Tilapia (3)				
* Spanish Sardine (13)	x		x	
* Atlantic Thread Herring (9)	x			
* White Mullet (6)	x			
* Liza (4)	x			

*Species supplied by local fishermen during our visits to the area.

Table A-3 List of Plants of Martín Peña Channel
and Its Surrounding Areas

Mangrove Swamp

- Rhizophora mangle - Red mangrove - Mangle rojo
Avicennia germinans - Black mangrove - Mangle negro
Laguncularia racemosa - White mangrove - Mangle blanco
Conocarpus erectus - Buttonwood - Mangle botón
Acrostichum aureum - Leather fern - Palmita de Río
A. danaefolium - Leather fern - Palmita de Río

Swampy Savanna

- Acrostichum aureum - Leather fern - Palmita de Río
A. danaefolium - Leather fern - Palmita de Río
Paspalum distichum - Joint grass - Saladillo
P. millegrana - Cortadora, Paja brava
Typha domingensis - Cattail - Enea
Echinochloa colona - Jungle rice - Arroz del Monte
Saccharum spontaneum - Wild Sugar Cane - Caña de Azúcar
Brachiaria purpurascens - Para grass - Malojillo
Eleocharis mutata - Sedge - Junco
Cyperus ligularis - Water Sedge - Junco de Agua
C. giganteus - Marsh Sedge - Junco de Ciénaga
C. alternifolius - Umbrella Sedge - Paraguaita
Nephrolepis exaltata - Boston fern - Helecho Boston
Sesbania sericea - Sesbania - Papagayo
Physalis angulata - Ground Cherry - Alquequenje, Sacabuche
Eriochloa polystachya - Malojilla

Table A-3 List of Plants (Cont.) (2)

Swampy Savanna (Cont.)

Panicum aquaticum - Yerba Acuática

Alternanthera philoxeroides - Alligator weed - Yerba de Caimán

Filled and Upland Areas

Panicum maximum - Giant Guinea grass - Yerba de Guinea

Brachiaria purpurascens - Para grass - Malojillo

Sesbania sericea - Sesbania - Papagayo

Sorghum halepense - Johnson grass - Yerba Johnson

Vigna luteola - Frijol Silvestre

Gossypium barbadense - Sea Island cotton - Algodón "Sea Island"

Albizia lebeck - Siris tree - Acacia Amarilla

A. procera - White Siris - Albicia

Ipomoea tiliacea - Morning Glory - Bejuco de Puerco

Merremia umbellata - Yellow Morning Glory - Aguinaldo Amarillo

Cyperus ira - Sedge - Junco

Cajanus cajan - Pigeon pea - Gandul

Eleusine indica - Wire grass - Yerba de Caballo

Cocus nucifera - Coconut palm - Palma de Coco

Rhynchelytrum repens - Natal grass - Arrocillo Colorado

Digitaria decumbens - Pangola grass - Yerba de Pangola

Sporobolus indicus - West Indian Rushgrass - Cerrillo

Andropogon pertusus - Hurricane grass - Yerba Huracán

Phyla nodiflora - Cape weed - Yerba de Sapo

Bidens pilosa - Shepherd's needle - Margarita, Romerillo

Table A-3 List of Plants (Cont.) (3)

Filled and Upland Areas (cont.)

Pennisetum purpureum - Elephant grass - Yerba Elefante

Malachra alceifolia - Bastard Okra - Malva de Caballo

Cynodon dactylon - Bermuda grass - Yerba Bermuda

Leptochloa filiformis - Arrow grass, Red sprangletop - Yerba de Hilo

Commelina diffusa - Blue French weed - Cohitre Azul

Phaseolus lathyroide - Wild bush bean - Habichuela Parada

Chamaesyce hypericifolia - No common name

Euphorbia heterophylla - Milkweed - Leche Vana, Lehecilla

Chloris barbata - Mexican blue grass - Horquetilla Morada, Paraguita

Terminalia catappa - Tropical Almond - Almendra

Phyllanthus acidus - Otaheiti gooseberry - Grosella

Paspalum fasciculatum - Grass

P. millegrama - Grass - Cortadora, Paja Brava

P. virgatum - Grass

Ricinus communis - Castor bean - Higuiereta, Ricino

Spathodea campanulata - African Tulip Tree - Tylipán Africano

Sacharum spontaneum - Wild sugar cane - Caña de Azúcar Silvestre

Pluchea odorata - Salvia

Passiflora edulis - Water Lemon Fruit - Parcha

Artocarpus altilis - Breadfruit Tree - Arbol de Pana

Annona muricata - Soursop - Guanábana

Mangifera indica - Mango - Mangó

Melicoccus bijugatus - Spanish lime, Genip - Quenepa

Genipa americana - Genipap - Jagua

Table A-3 List of Plants (Cont.) (4)

Filled and Upland Areas (cont.)

Thespesia populnea - Cork tree - Emajaquilla

Tamarindus indica - Tamarind - Tamarindo

Spondias purpurea - Spanish plum - Jobillo

Delonix regia - Royal Poinciana - Flamboyán

Eriochloa puntata - Malojilla

Table A-4 List of Animals in the Martín Peña Channel and Its Surrounding Areas

Birds

Pelecanidae: Pelicans

Pelecanus occidentalis - Brown Pelican - Pelicano

Fregatidae: Frigatebirds

Fregata magnificens - Magnificent Frigatebird - Tijereta, Rabijunco

Ardeidae: Herons and Bitterns

Ardea herodias - Great Blue Heron - Garzón Cenizo

Butorides virescens - Green Heron - Martinete

Florida caerulea - Little Blue Heron - Garza Azul

Bubulcus ibis - Cattle Egret - Garza Ganadera

Dichromanassa rufescens - Reddish Egret - Garza Roja

Casmerodius albus - Great Egret - Garza Real

Egretta thula - Snowy Egret - Garza Blanca

Hydranassa tricolor - Louisiana Heron - Garza Pechiblanca

Nyctanassa violacea - Yellow-crowned Night Heron - Yaboa Común

Ixobrychus exilis - Least Bittern - Martinetito

Threskiornithidae: Ibises and Spoonbills

Eudocimus albus - White Ibis - Coco Blanco

Anatidae: Swans, Geese, and Ducks

Anas bahamensis - White-cheeked Pintail - Pato Quijada Colorada

A. discors - Blue-winged Teal - Pato Zarcel

Accipitridae: Hawks and Eagles

Buteo jamaicensis - Red-tailed Hawk - Guaraguao Común

Pandionidae: Ospreys

Pandion haliaetus - Osprey - Aguila de Mar

Falconidae: Caracaras and Falcons

Falco sparverius - Sparrow Hawk or American Kestrel - Falcón Común, Falconcito

Rallidae: Rails, Gallinules and Coots

Rallus longirostris - Clapper Rail - Pollo de Mangle

Gallinula chloropus - Common Gallinule - Gallareta Común

Table A4 List of Animals (Cont.) (2)

Charadriidae: Plovers, Turnstones and Surfbirds

Charadrius vociferus - Killdeer - Playero Sabanero
C. semipalmatus - Semipalmated Plover - Playero Acollarado
C. alexandrinus - Snowy Plover - Playero Blanco
C. wilsonia - Wilson's Plover - Playero Marítimo
Pluvialis dominica - Lesser Golden Plover - Playero Dorado
P. squatarola - Black-bellied Plover - Playero Cabezón
Arenaria interpres - Ruddy Turnstone - Playero Turco

Scolopacidae: Woodcock, Snipes and Sandpipers

Capella gallinago - Common Snipe - Becasina
Numenius phaeopus - Whimbrel - Playero Pico Corvo
Actitis macularia - Spotted Sandpiper - Putilla
Tringa melanoleuca - Greater Yellowlegs - Playero Guineilla Grande
T. flavipes - Lesser Yellowlegs - Playero Guineilla Pequeño
Catoptrophorus semipalmatus - Willet - Playero Aliblanco
Calidris canutus - Red Knot - Playero Gordo
C. melanotos - Pectoral Sandpiper - Playero Manchado
C. minutilla - Least Sandpiper - Playero Menudo
C. fuscicollis - White-rumped Sandpiper -
C. alpina - Dunlin -
C. pusilla - Semipalmated Sandpiper - Playero Gracioso
C. mauri - Western Sandpiper - Playero Occidental
C. alba - Sanderling - Playero Arenero
Limodromus griseus - Short-billed Dowitcher - Chorlo Pico Corto
L. scolopaceus - Long-billed Dowitcher - Chorlo Pico Largo
Micropalama himantopus - Stilt Sandpiper - Playero Patilargo
Limosa haemastica - Hudsonian Godwit

Recurvirostridae: Avocets and Stilts

Himantopus mexicanus - Black-necked Stilt - Viuda

Laridae: Gulls and Terns

Larus marinus - Greater Black-backed Gull
L. fuscus - Lesser Black-backed Gull
L. argentatus - Herring Gull - Gaviota Argentea
L. delawarensis - Ring-billed Gull - Gaviota Piquicercos
L. atricilla - Laughing Gull - Gaviota Cabecinegra
L. ridibundus - Black-headed Gull
L. pipixcan - Franklin's Gull
Gelochelidon nilotica - Gull-billed Tern
Sterna forsteri - Forster's Tern
S. hirundo - Common Tern - Gaviota Común
S. dougallii - Roseate Tern - Palometa
S. albifrons - Little Tern - Gaviota Pequeña

Table A-4 List of Animals (Cont.) (3)

Laridae: Gulls and Terns (cont.)

Sterna maxima - Royal Tern - Gaviota Real
S. sandvicensis - Sandwich Tern - Gaviota Pico Agudo
S. caspia - Caspian Tern -
Thalasseus corygnatha - Cayenne Tern -
Chlidonias niger - Black Tern - Gaviota Ceniza

Rynchopidae: Skimmers

Tynchops niger - Black Skimmer

Columbidae: Pigeons and Doves

Zenaida aurita - Zenaida Dove - Tórtola
Z. asiatica - White-winged Dove - Tórtola Aliblanca
Columbina passerina - Ground Dove - Rolita
Columba livia - Rock Dove - Paloma

Psittacidae: Lories, Parrots, Parakeets and Macaws

Myiopsitta monachus - Monk Parakeet - Perico Monje

Cuculidae: Cuckoos, Roadrunners and-Anis

Crotophaga ani - Smooth-billed Ani - Judío

Trochilidae: Hummingbirds

Anthracothorax dominicus - Antillean Mango - Zumbador Dorado

Alcenidae: Kingfishers

Ceryle alcyon - Belted Kingfisher - Martín Pescador

Tyrannidae: Tyrant Flycatchers

Tyrannus dominicensis - Gray kingbird - Pitirre

Hirundinidae: Swallows

Petrochelidon fulva - Cave Swallow - Golondrina de Cueva
Progne dominicensis - Caribbean Martin - Golondrina de Iglesias

Coerebidae: Honeycreepers

Coereba flaveola portoricensis - Bananaquit - Reinita Común

Table A-4 List of Animals (Cont.) (4)

Parulidae: Wood Warblers

Parula americana - Northern Parula Warbler - Reinita Pechi-dorada
Dendroica petechia - Yellow Warbler - Canario de Mangle
D. discolor - Prairie Warbler - Reinita Galana
Mniotilta varia - Black and White Warbler - Reinita Trepadora
Seiurus noveboracensis - Northern Waterthrush - Pizpita de Mangle
S. aurocapillus - Ovenbird - Pizpita Dorada
Setophaga ruticilla - American Redstar - Candelita
Geothlypis trichas - Northern Yellow throat - Reinita Pica Tierra Grand

Ploceidae: Weaver Finches

Estrilda melpoda - Orange-cheeked Waxbill - Veterano
Amandava amandava - Red Munia or Strawberry Finch - Amandava
Lonchura cucullata - Bronze Mannikin
L. punctulata - Spice Finch - Gorrión Nuez Moscada
Padda oryzivora - Java Sparrow - Gorrión de Java

Icteridae: Meadowlarks, Blackbirds and Orioles

Quiscalus niger - Greater Antillean Grackle - Chango, Mozambique
Molothrus bonariensis - Glossy Cowbird - Tordo
Agelaius xanthomus - Yellow-shouldered Blackbird

Fringillidae: Grosbeaks, Finches, Sparrows, Buntings

Triaris bicolor - Black-faced Grassquit - Gorrión Negro, Chamorro

Fish

Megalopidae

Megalops atlanticus - Tarpon - Sábalo

Poeciliidae

Poecilia vivipara - Guppy - Gupi

Centropomidae

Centropomus undecimalis - Common Snook - Robalo Común

Gerreidae

Diapterus olisthostomus - Irish Mojarra - Mojarra
D. rhombeus - Romboid Mojarra - Mojarreta

Table A-4 List of Animals (Cont.) (5)

Scianidae

Bairdiella ronchus - Ground Drummer - Corvino

Cichlidae

Tilapia mossambica - Tilapia - Tilapia de Mozambique

Clupeidae

Sardinella aurita - Spanish Sardine - Cascanua

Opisthonema oglinum - Atlantic Thread Herring - Machuelo

Mugilidae

Mugil curema - White Mullet - Jarea

M. lisa - Liza - Lisa

Sparidae

Archosargus rhomboidalis - Sea Bream - Chopa Amarilla

Crustaceans

Pontunidae

Callinectes spp. - Bluecrab - Cocolía

Gecarcinidae

Cardisoma guanhumi - Land Crab - Juey Común

Ocypodidae

Uca spp. - Fiddler Crab - Cangrejo Violinista

Grapsidae

Grapsus grapsus - Rock Crab - Cangrejo de Rocas

Aratus pisonii - Aerial Tree Crab - Cangrejo Arboreo

Goniopsis cruentata - Red Mangrove Crab - Cangrejo Rojo de Mangle

Table A-4 List of Animals (Cont.) (6)

Reptiles and Amphibians

Anolis stratulus - Common Anoles - Lagartijo
A. cristatellus - Common Anoles - Lagartijo
A. pulchellus - Grass Anole - Lagartijo de Yervas

Leptodactylus albilabris - White-lipped Frog - Sapito de Pantanos

Bufo marinus - Surinam Toad - Sapo Común

Mammals

Rodentia

Muridae

Rattus rattus - Black Rat - Rata Negra

Carnivora

Viverridae

Herpestes javanicus auropunctatus - Mongoose - Ardilla, Mangosta

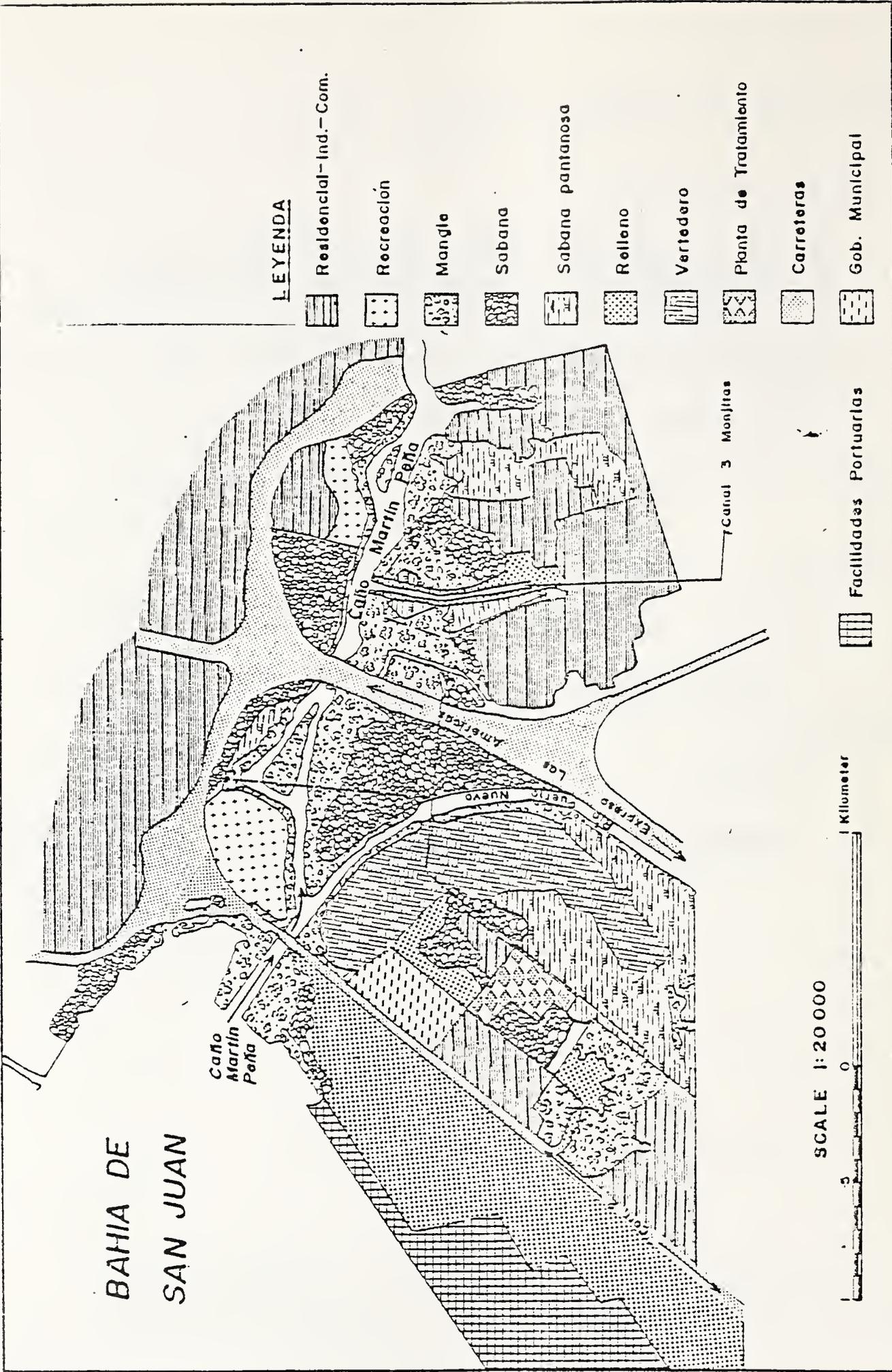


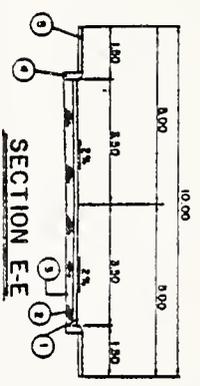
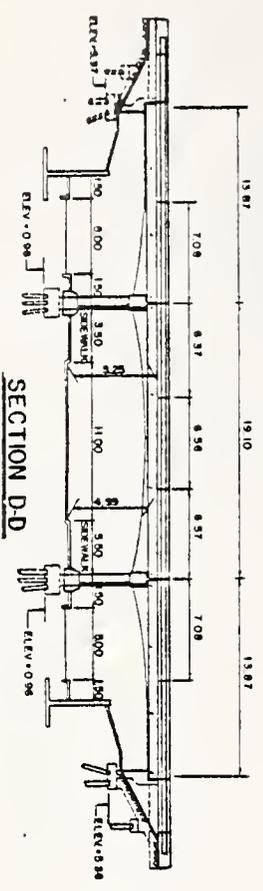
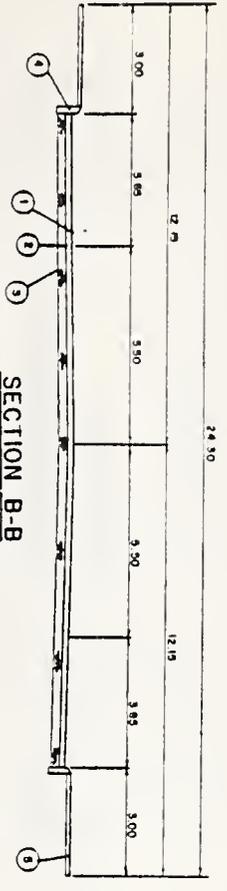
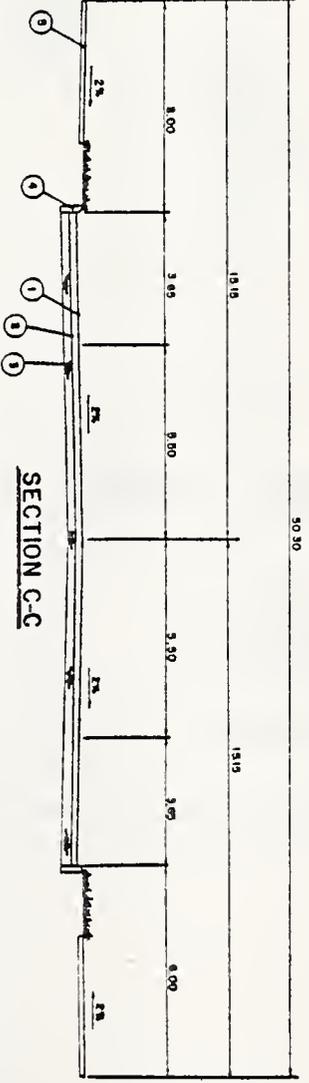
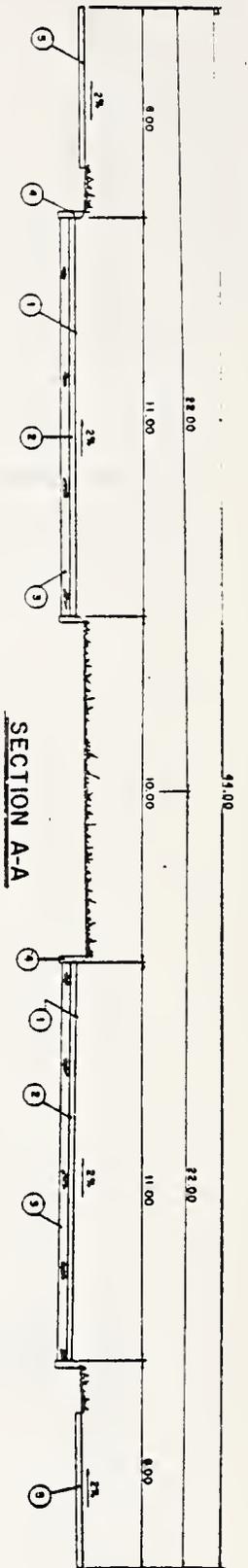
Figure A-1

TRANSLATION OF LEGEND FOR FIGURE A-1

<u>Spanish</u>	<u>English</u>
Residencial-Ind.Com	Residential, industrial and commercial
Recreación	Recreation
Mangle	Mangrove
Areas altas y rellenas	Upland and filled areas
Sabana Pantanosa	Swampy Savanna
Relleno	Landfill
Vertedero	City Dump Site
Planta de Tratamiento	Sewage Treatment Plant
Carreteras	Roads
Gobierno Municipal	City Govt.

APPENDIX B
BUSWAY ALTERNATIVES

PROJECT	STATE ROAD NO.	MUNICIPALITY	ISLAND	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
					3	13



- LEGEND**
- ① - 0.05 HOT PLAN BITUMINOUS SURFACE COURSE AND TYPE III 4
 - ② - 0.10 HOT PLAN BITUMINOUS BASE COURSE TYPE III 4
 - ③ - 0.20 CRUSHED STONE BASE COURSE CLASS (2) GRADE III 4
 - ④ - CONCRETE CURB TYPE "C"
 - ⑤ - 0.10 CONCRETE SIDEWALK

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGNED AND RECONSTRUCTION AREA

TYPICAL SECTIONS

BY	REVISION	DATE
DESIGNED TRACED	JACQUELINE C ACEVEDO	4/09/05



MATCH LINE WITH SHEET NO. 3

MATCH LINE WITH SHEET NO. 11

V
IV
III
II
I

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA - GUAGUA" PROJECT

DATE: 01/01/01
DESIGNED BY: [REDACTED]
CHECKED BY: [REDACTED]
REVISION

Scale 1:1,000

ALTERNATIVE # 1

DESIGNED BY: RAFAEL A. VERA SORRELLA (E-10000-101-001)

I
II
III
IV
V

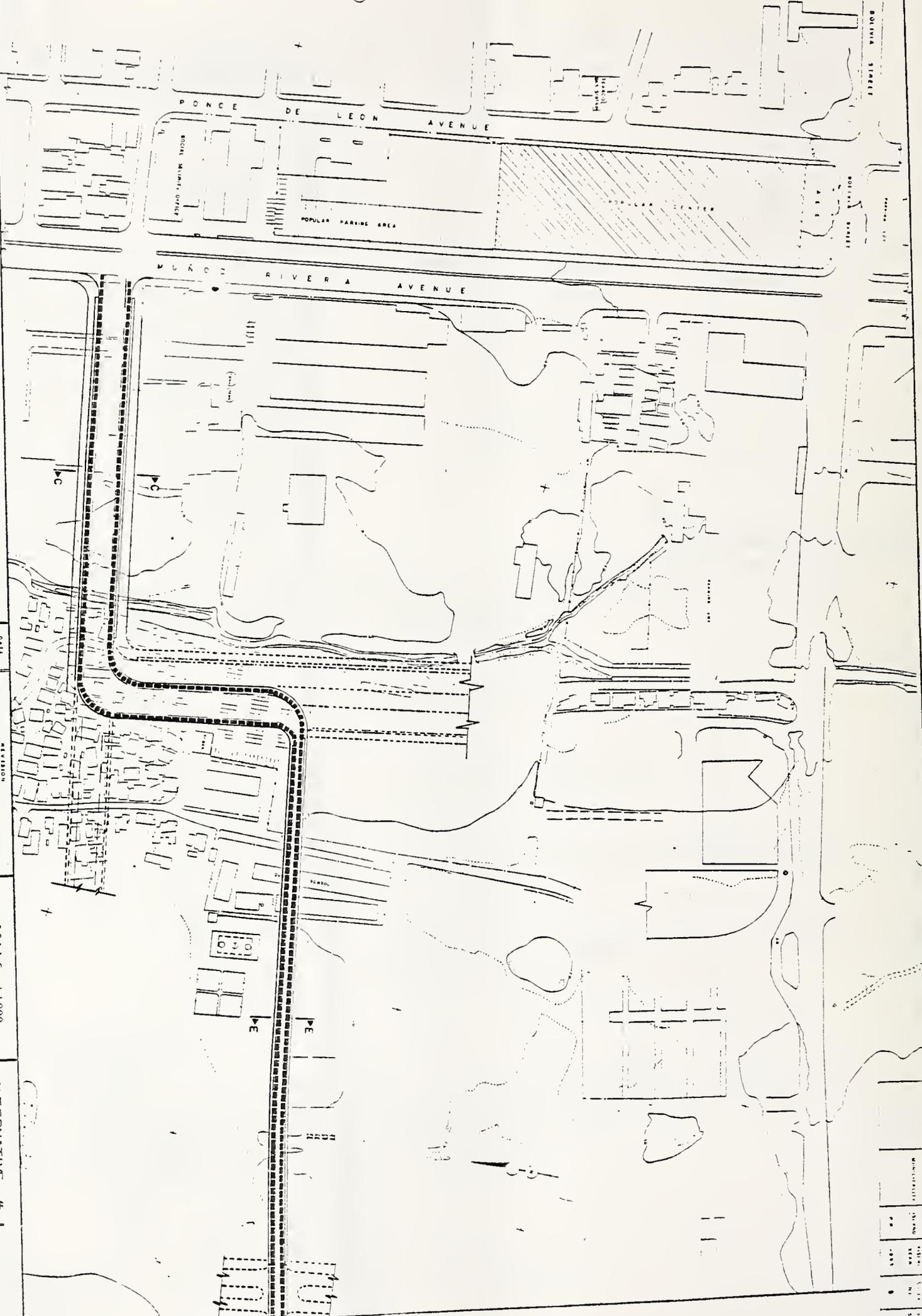
DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
'AGUA - GUAGUA' PROJECT

DATE DESIGNED
DATE REVISION

SCALE 1:1,000

ALTERNATIVE # 1



MATCH LINE WITH SHEET NO 4

NO.	DATE	BY	REVISION

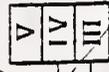
MATCHLINE WITH SHEET NO. 5



MATCHLINE WITH SHEET NO. 11

DATE	1988
BY	...
SCALE	1:1,000
PROJECT	...

DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS DESIGN AND RECONSTRUCTION AREA	SAN JUAN URBAN CORE TRANSIT SYSTEM "AGUA - GUAGUA" PROJECT	SCALE 1:1,000	ALTERNATIVE # 2
		DATE 1988	REVISION



PLACID A. VERA SOMARAY (OWNER USE ONLY)

I
II
III
IV
V

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

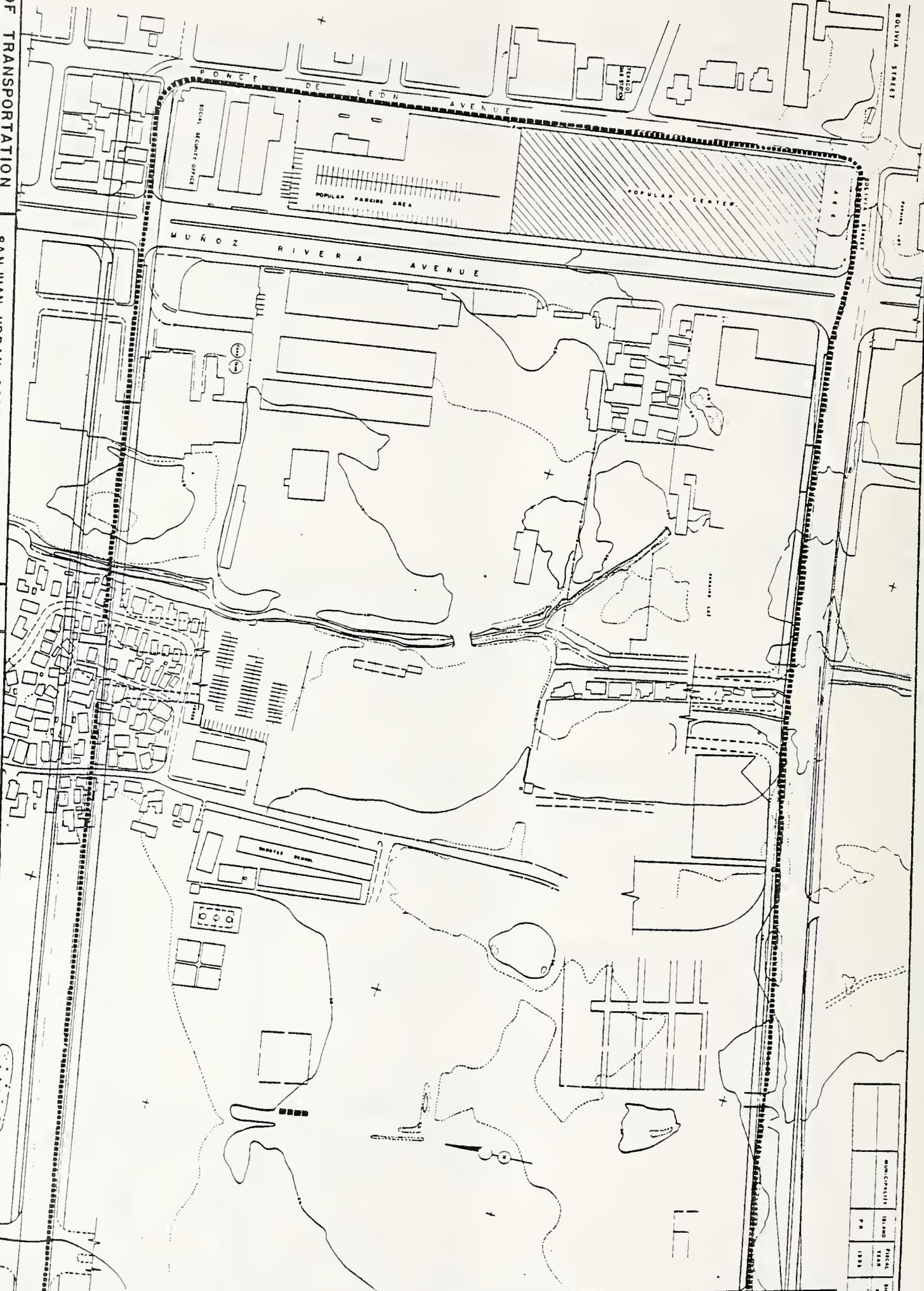
SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA - GUAGUA" PROJECT

DATE
DESIGNED
TRACED

REVISION

SCALE 1:1,000

ALTERNATIVE # 2



MATCH LINE WITH SHEET NO. 6

NO. OF PLATS	ISLAND	FISCAL	SHEET	TOTAL
24	1983	5	18	

MATCH LINE WITH SHEET NO. 7

V
IV
III
II
I

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA - GUAGUA" PROJECT

DATE
DESIGNED
CHECKED
TRACED

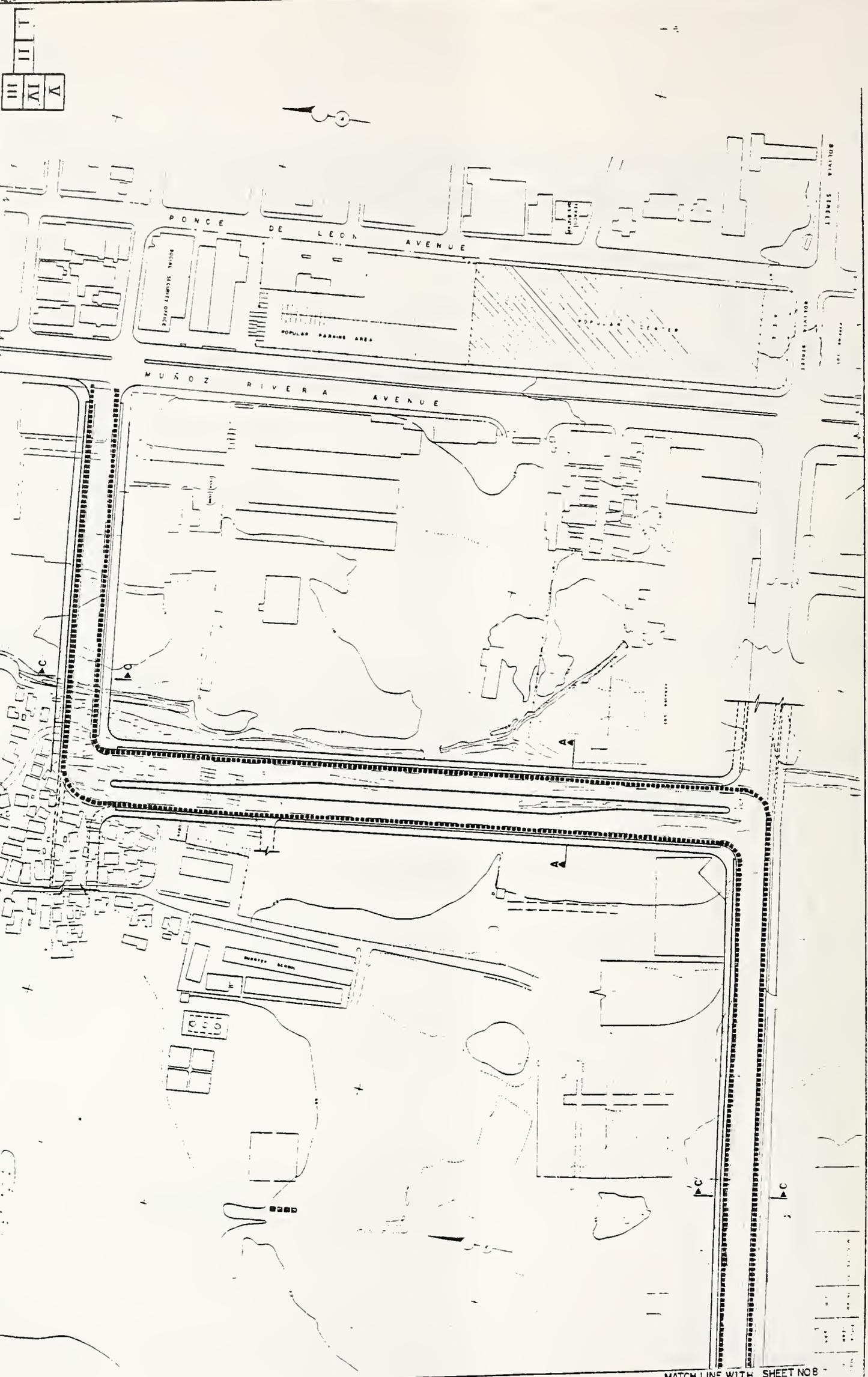
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ALTERNATIVE # 3



REVISION
DRAWN BY
CHECKED BY
DATE

FLORIAN A. VERA BONVILLE (ENGINEER IN CHARGE)



DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
AGUA - GUAGUA PROJECT

DATE	REVISION

SCALE 1:1,000

ALTERNATIVE # 3

MATCH LINE WITH SHEET NO 8



MATCH LINE WITH SHEET NO. 11

ALTERNATIVE # 4

REVISION
PLANNING & VISUAL PRESENTATION (ENHANCED IN WEST)

DATE	REVISION
1980	PLANNING & VISUAL PRESENTATION (ENHANCED IN WEST)

SAN JUAN URBAN CORE TRANSIT SYSTEM
 AGUA - GUAGUA PROJECT

DEPARTMENT OF TRANSPORTATION
 AND PUBLIC WORKS
 DESIGN AND RECONSTRUCTION AREA

V
IV
III

I	II
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MATCH LINE WITH SHEET 9

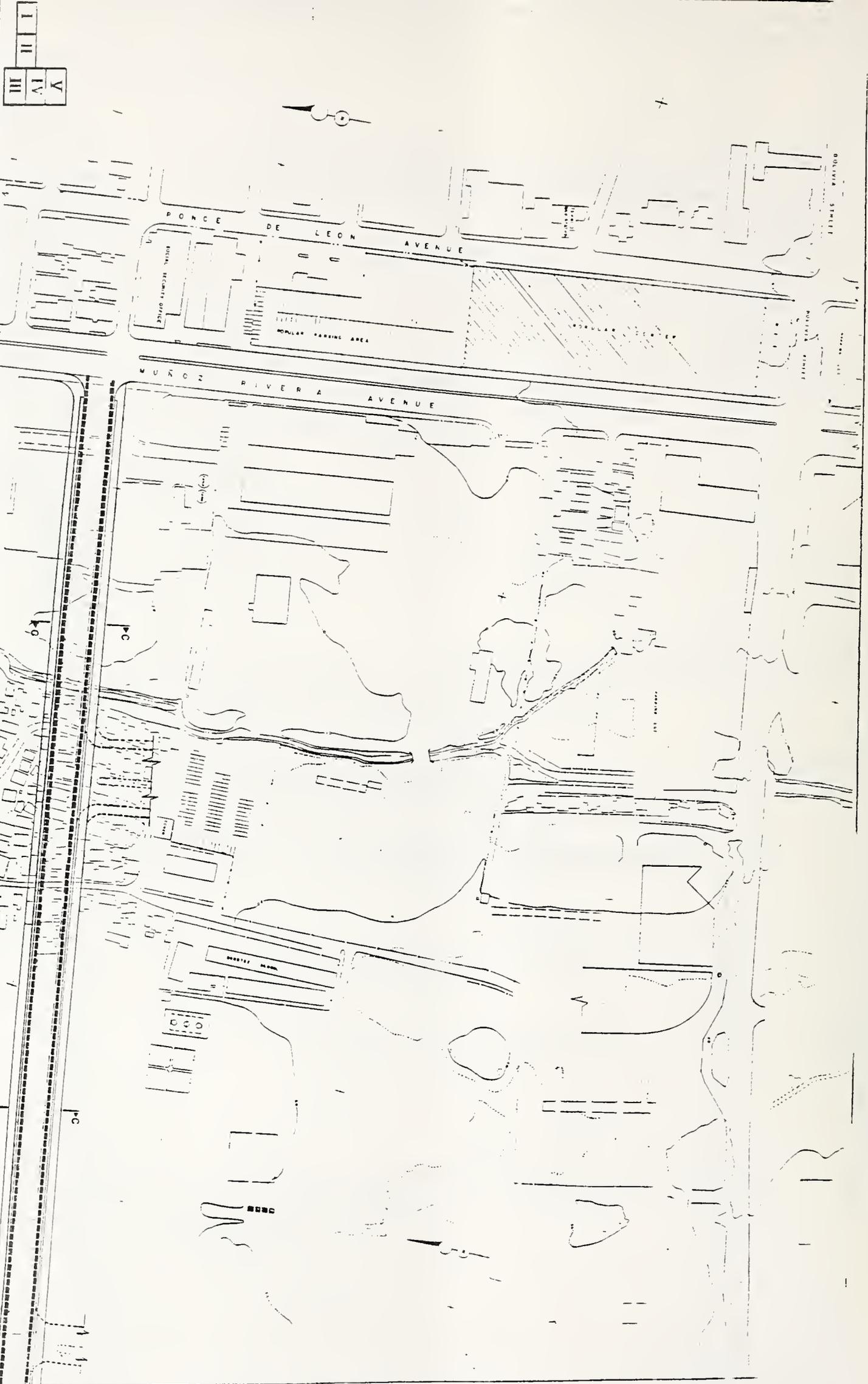
DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA - GUAGUA" PROJECT

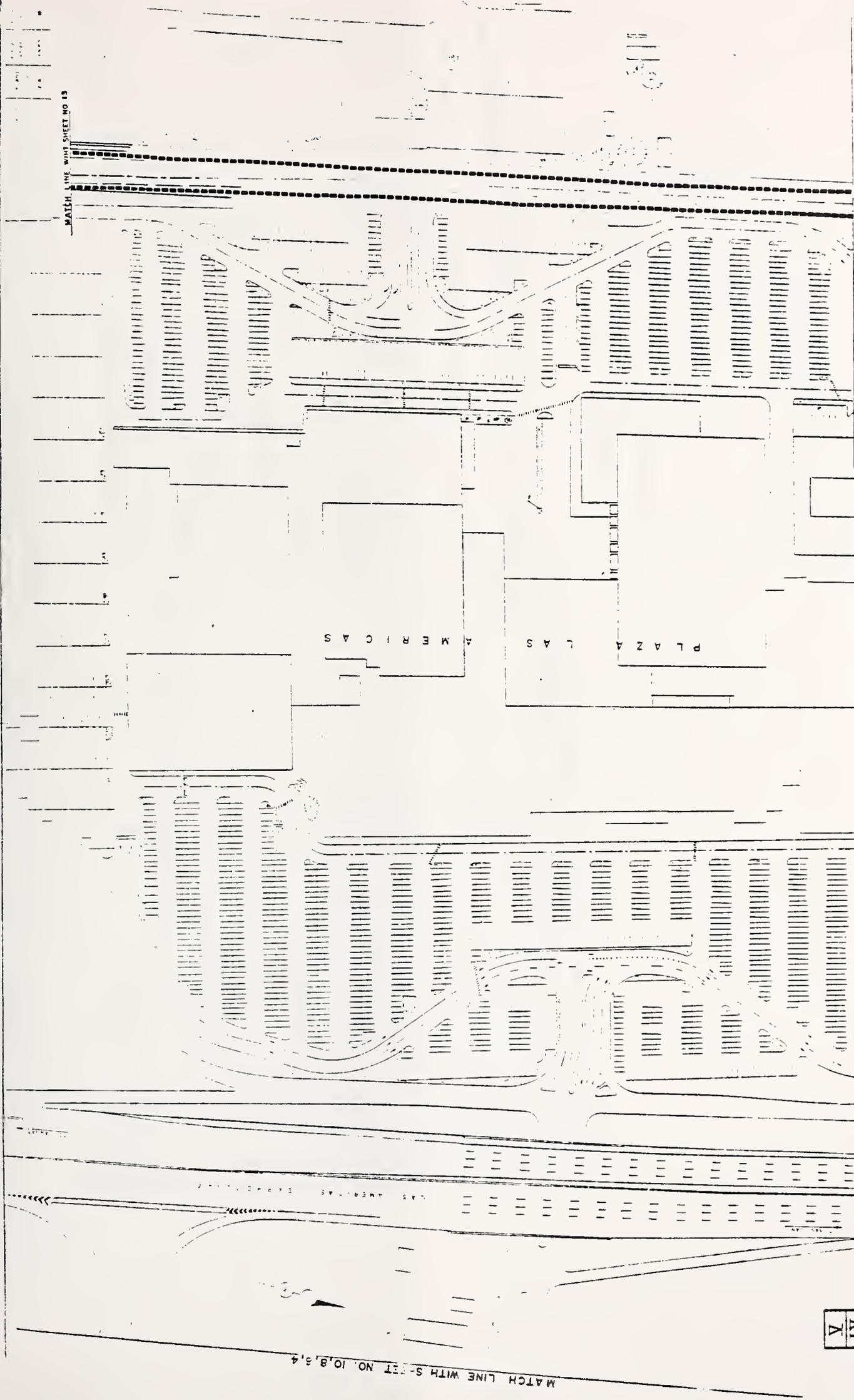
DATE: _____
DRAWING NUMBER: _____
REVISION: _____

SCALE 1"=1,000'

ALTERNATIVE # 4



MATCH LINE WITH SHEET NO 10



MATCH LINE WITH SHEET NO. 13

MATCH LINE WITH SHEET NO. 11

MATCH LINE WITH SHEET NO. 10, 9, 8, 7, 6, 5, 4

V
IV
III
II
I

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA - GUAGUA" PROJECT

DATE
REVISION
PROJECT

SCALE 1:1,000

ALL ALTERNATIVES

MATCH LINE WITH SHEET NO. 10, 8, 6, 4

I
II
III
IV
V

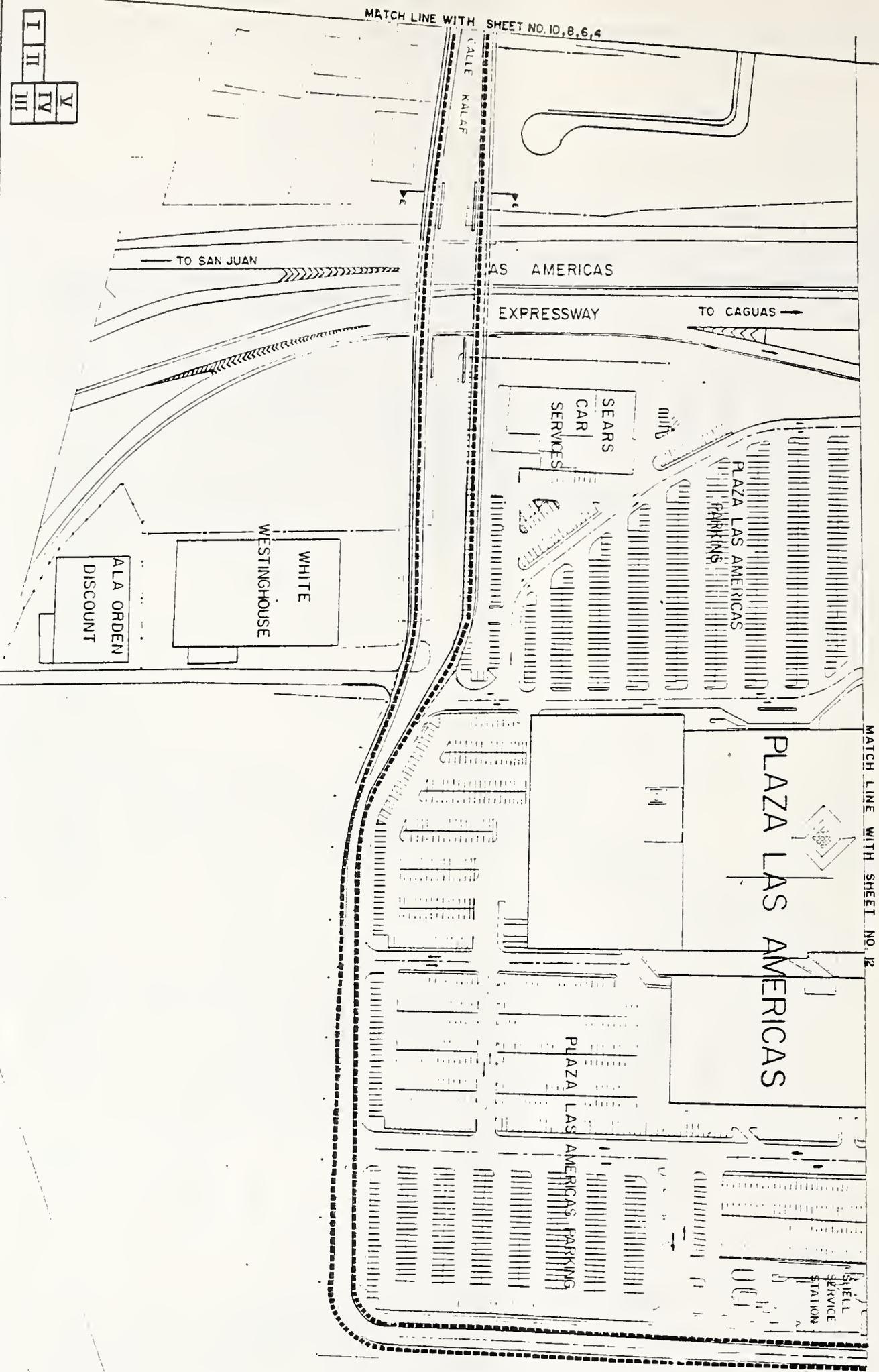
DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA GUAGUA" PROJECT

DATE	REVISION
ISSUED	REVISED
DESIGNED	BY
CHECKED	DATE

FILE 11

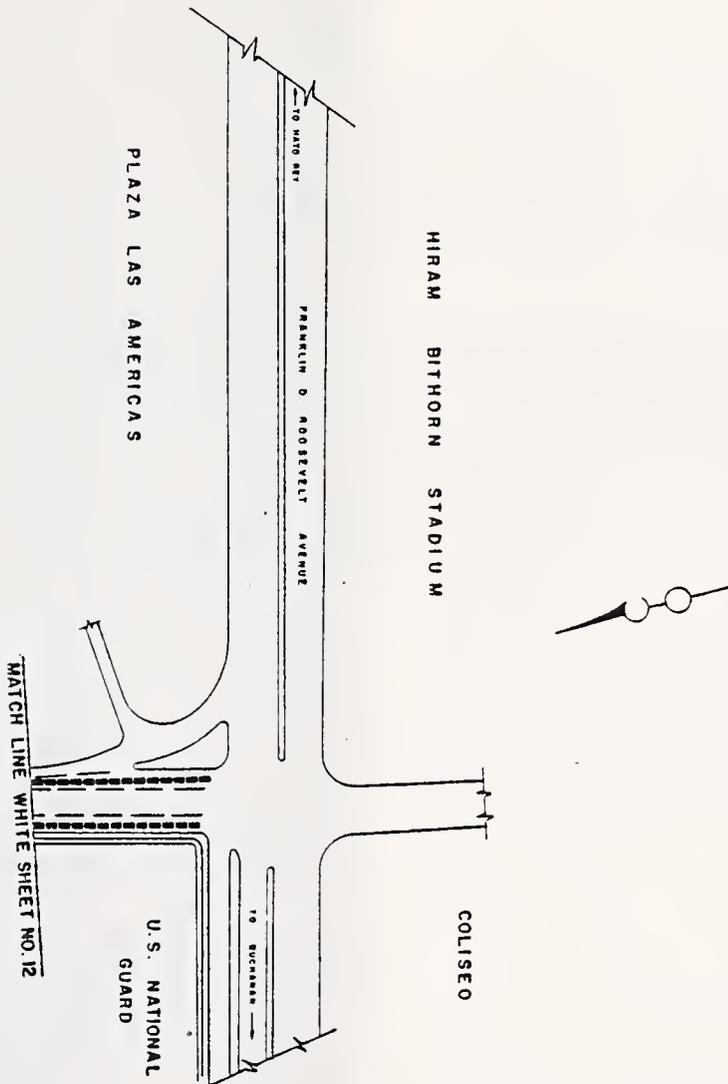
ALTERNATIVES



MATCH LINE WITH SHEET NO. 12

DATE	BY	DATE	BY

DESIGNER	DATE	PROJECT	SHEET	TOTAL
			10	15



V
IV
III
II
I

DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS
DESIGN AND RECONSTRUCTION AREA

SAN JUAN URBAN CORE TRANSIT SYSTEM
"AGUA + GUAGUA" PROJECT

DATE	REVISION

SCALE 1:1,000

ALL ALTERNATIVES

APPENDIX C
GEOTECHNICAL INFORMATION AND PRELIMINARY
DESIGN FOR CHANNEL ALTERNATIVES

PLEASE NOTE:

The design for the alternatives are as follows:

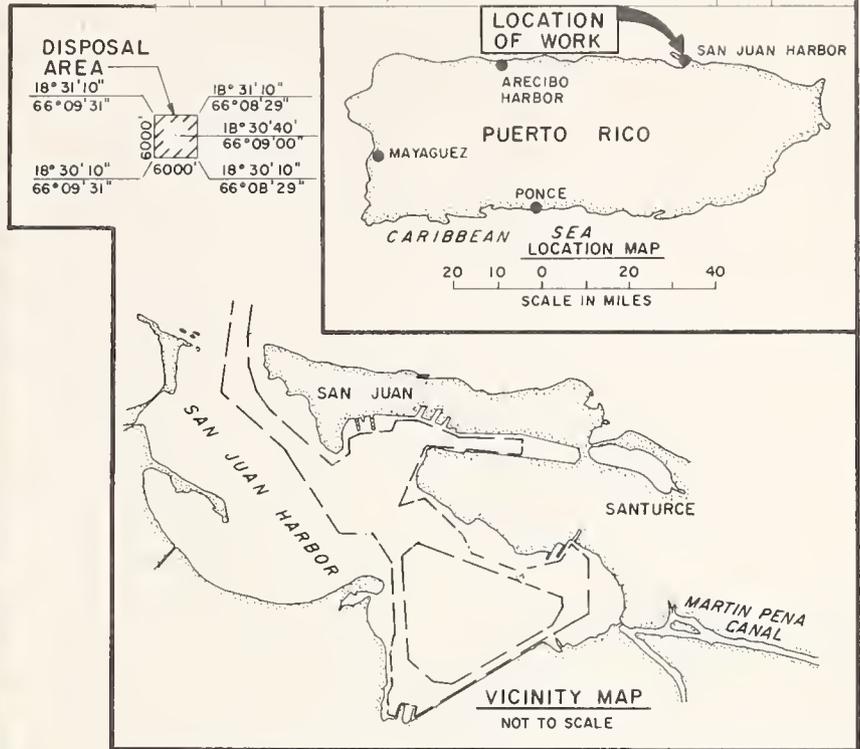
Alternative 1 = Plan 1
Alternative 2 = Plan 3
Alternative 3 = Plan 4
Alternative 4 = Plan 2

No designs were prepared for Alternatives 5 and 6.

Y ON THIS JOB
ENDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO USC & GS STATION MORRO L/H ECC (USE), (NGS ADJUSTMENT OF 1979) USING SECOND ORDER, CLASS II ACCURACY STANDARDS.

VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NOS, TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U. S. NAVY RESERVATION. (IRE: NOS. 975-5370, DATED 24 MAR 1971). ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MLW ELEVATION OF NOS. B. M. NO. 13, 1965 (11.025 FEET) WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL IN THE PROJECT. MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1962 - DECEMBER 1963, REDUCED TO MEAN VALUES.

PHOTOMAPPING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1983 BY RILEY, PARK, HAYDEN & ASSOCIATES (ATLANTA, GA.) AND SOUTHERN RESOURCE MAPPING CORP. (ORMOND BEACH, FL).

PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN BY SRM CORP. ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 550'.

HIGH ALTITUDE AIR PHOTOMAPPING PHOTOGRAPHY WAS FLOWN BY SRM CORP. ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 2000'.

PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION, BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1983.

ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.

CONTOUR INTERVAL 2 FEET.

ARCHIVED DATA SOURCES:

PHOTOGRAPHY: PUERTO RICO, MARTIN PENA CANAL, DATED 28 JAN 1983.

FIELD BOOKS: PUERTO RICO FIELD BOOKS 23, 24, 25, 26 AND 27, DATED 1983.

GRID COORDINATES ARE BASED ON LAMBERT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO.

STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDENER STATIONING.

ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (-) SIGN.

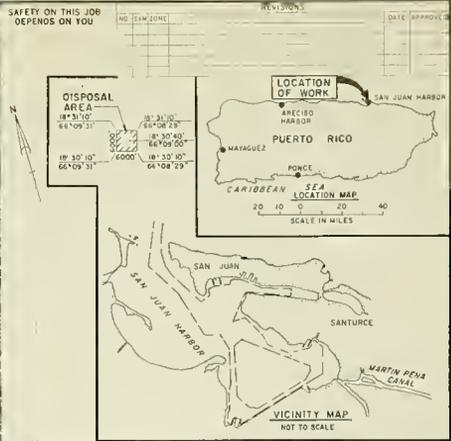
SEE SHEET NO. 2 FOR LEGEND.

GRAPHIC SCALE

SOUTHERN RESOURCE MAPPING CORP.



PREPARED BY: CHIEF, LEVEE & WATERWAYS SECTION	DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA
SUBMITTED BY: CHIEF, DESIGN BRANCH	SAN JUAN, PUERTO RICO
APPROVAL RECOMMENDED	AGUA-GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION
CHIEF, ENGINEERING DIVISION	CHANNEL (PLAN I) LOCATION AND INDEX
APPROVED:	INV. NO. _____ SIZE DWG. NO. _____
COL. C.E. _____ DETACH. ENGINEER	DATED _____
OWN BY: <i>DAB</i>	SCALE: AS SHOWN
CRD. BY: _____	DATED: _____
	SHEET 1 OF 12



- NOTES**
- HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO BSC 65 STATION 100R01 IN ECC (USE), (NGS ADJUSTMENT OF 1994) USING SECOND ORDER, CLASS II ACCURACY STANDARDS.
 - VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NOS. TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U.S. NAVY RESERVATION - (REDS. 405-530), DATED 28 JAN 1971. ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MEAN ELEVATION OF NOS. 8 AL NO. 13 TOWS 11.05 FEET WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL IN THE PROJECT. MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1967 - DECEMBER 1969, REDUCED TO MEAN VALUES.
 - PHOTOMAPPING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1983 BY RILEY, PARK, HAYDEN & ASSOCIATES (ATLANTA, GA.) AND SOUTHERN RESOURCE MAPPING CORP. (OMNIBUS BEACH, FL).
 - PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN BY SRA CORP. ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 500'.
 - HIGH ALTITUDE AIR PHOTOGRAPHY WAS FLOWN BY SRA CORP. ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 2000'.
 - PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1983.
 - ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
 - CONTOUR INTERVAL 2 FEET.
 - ARCHIVED DATA SOURCES:
PHOTOGRAPHY - PUERTO RICO, MARTIN PEÑA CANAL, DATED 28 JAN 1983.
FIELD BOOKS - PUERTO RICO FIELD BOOKS 23, 24, 25, 26 AND 27, DATED 1983.
 - GRID COORDINATES ARE BASED ON LAHBERT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO.
 - STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDER STATIONING.
 - ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (-) SIGN.
 - SEE SHEET NO. 2 FOR LEGEND.

GRAPHIC SCALE

SOUTHERN RESOURCE MAPPING CORP. 400' 0 400' 800'

DRAWN BY: [Signature] CHECKED BY: [Signature] DATE: [Date] BY: [Signature] DATE: [Date]	<p>DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA</p> <p>SAN JUAN, PUERTO RICO</p> <p>AGUA - GUAGUA PROJECT DREDGING MARTIN PEÑA NAVIGATION</p> <p>CHANNEL PLAN 33 LOCATION AND INDEX</p> <p>BY: [Signature] DATE: [Date] SCALE: AS SHOWN DATED: [Date] SHEET 1 OF 2</p>
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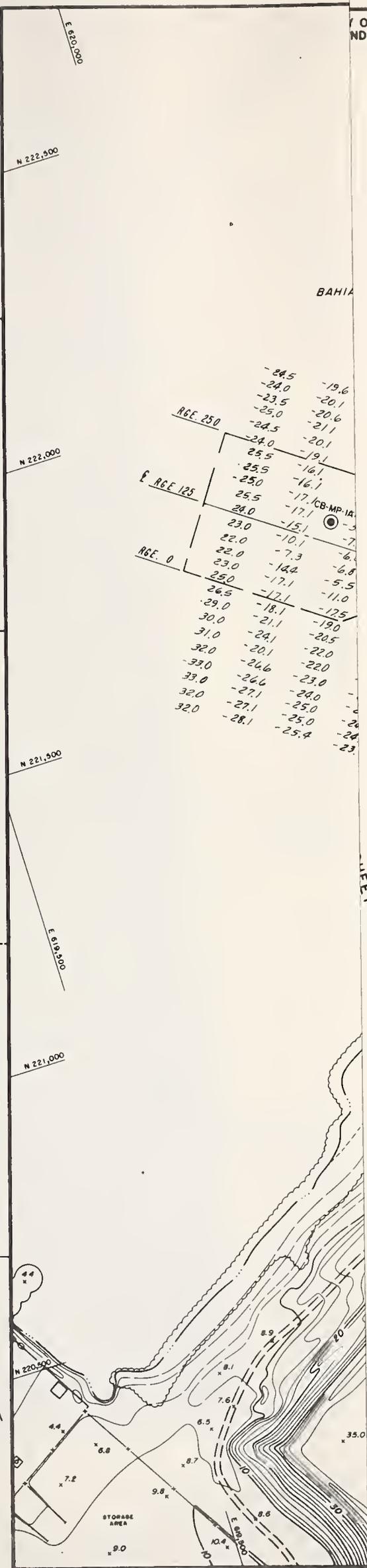


ON THIS JOB
ANDS ON YOU

NO. SYM ZONE			REVISIONS		DATE	APPROVED

LEGEND

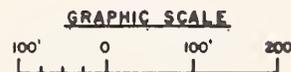
- BUILDINGS
- ROADS
- DRIVE, PARKING AREA
- GUARD RAIL
- FENCE
- POWER LINE
- TOWER
- POLE
- LIGHT POLE
- MANHOLE
- SIGN
- FIRE HYDRANT
- VALVE
- CATCH BASIN
- CONTOURS
- DEPRESSION CONTOURS
- TREE CLUSTER
- PALM TREE
- WATER
- SWAMP
- HORIZONTAL CONTROL
- SPOT ELEVATION
- PROJECT CHANNEL
- AREA TO BE DREDGED
- DISPOSAL AREA
- SOUNDING AND LOCATION
- CORE BORING LOCATION AND DESIGNATION



SHEET NO. 3



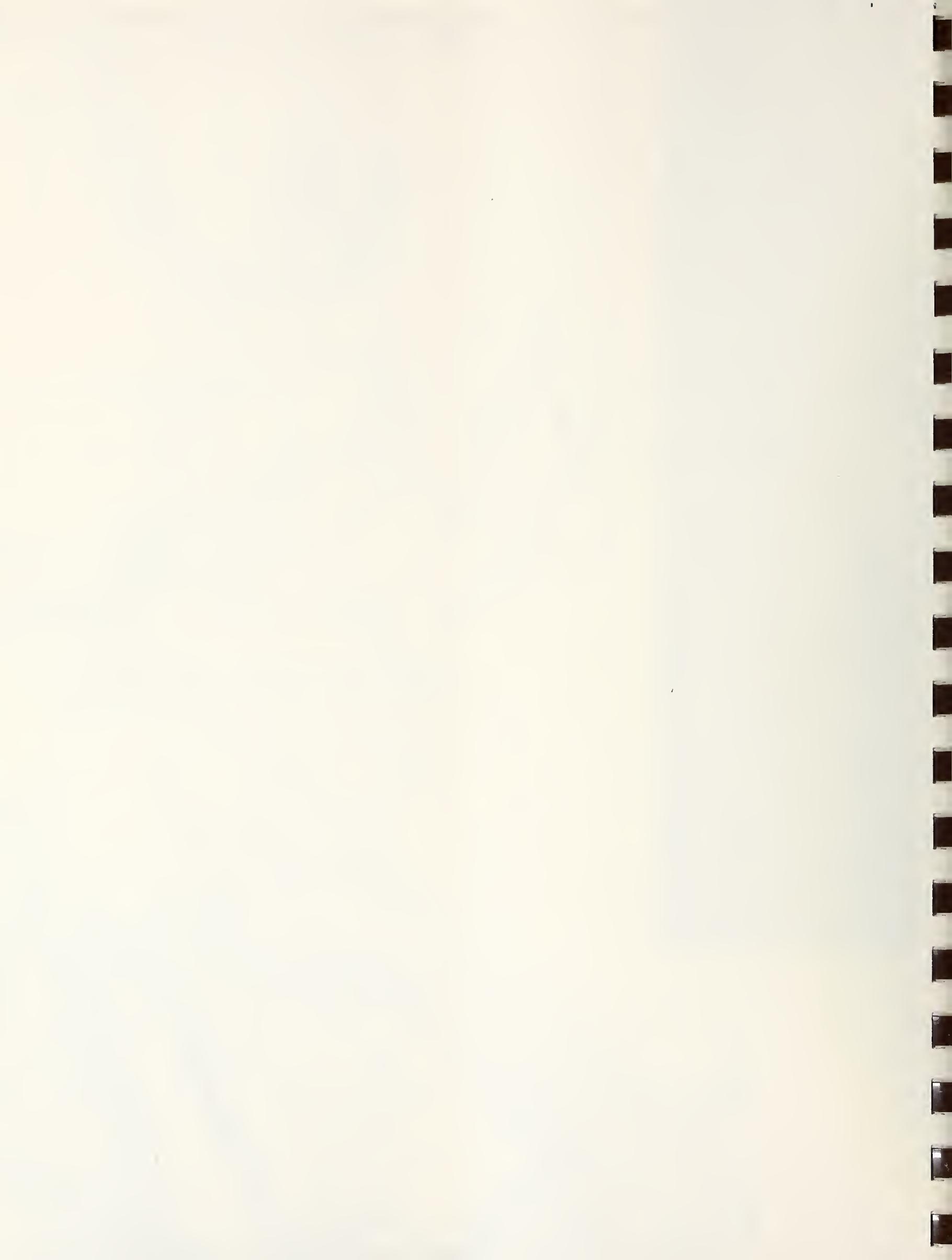
NOTE: SEE SHEET 1 FOR NOTES.

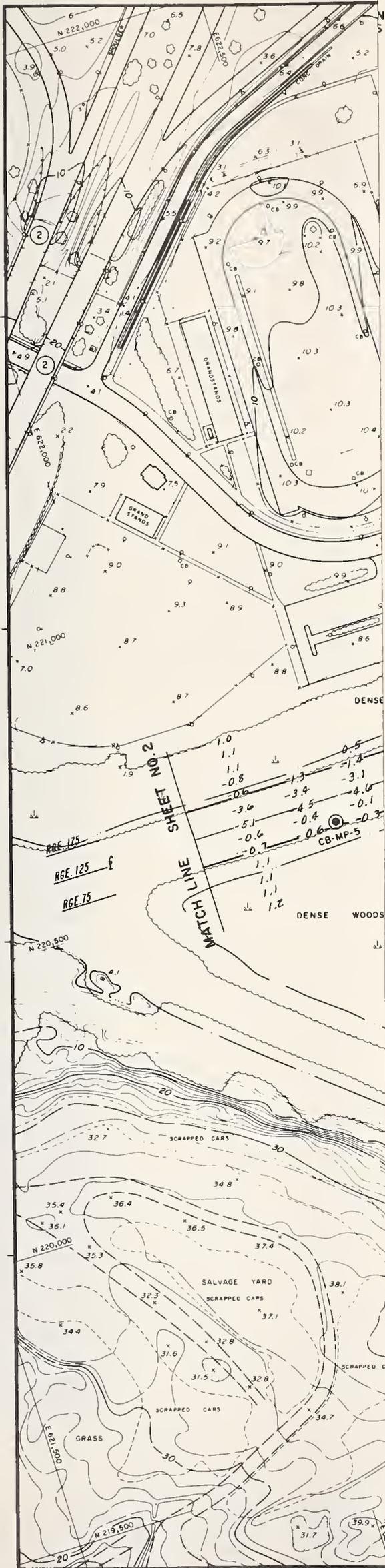


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN I)
PLAN

SCALE: AS SHOWN DATE: _____



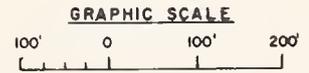


IN THIS JOB
ON YOU

REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		



NOTE: SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND.



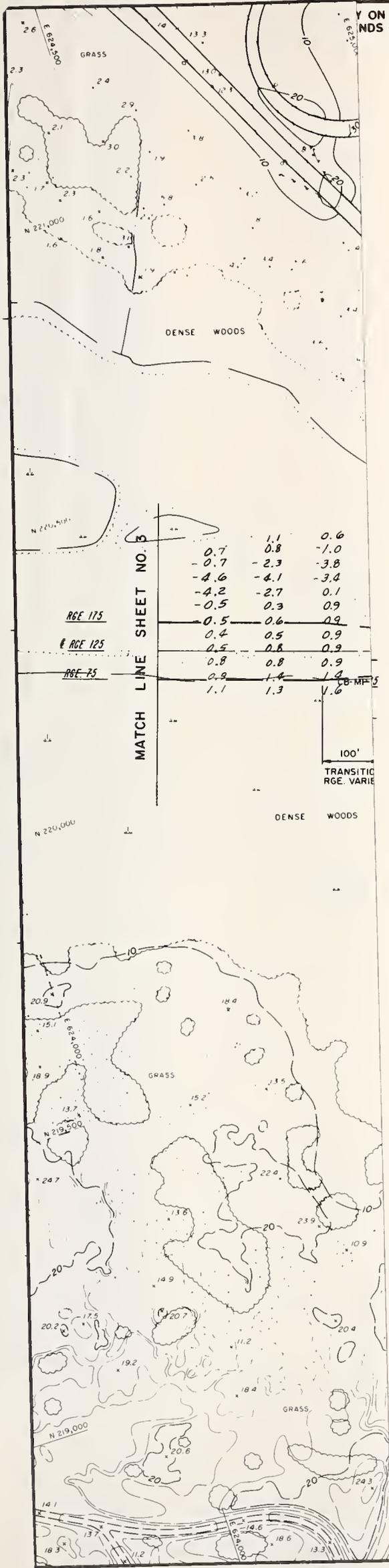
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA - GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN I)
PLAN

DESIGN ENG.:	REV. NO.	DATE	APP. NO.
DRAWN BY:	DATE	SCALE: AS SHOWN	DATED:
			SHEET

ON THIS JOB
ANDS ON YOU

REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		

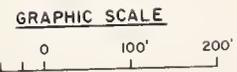


	1.1	0.6
0.7	0.8	-1.0
-0.7	-2.3	-3.8
-4.6	-4.1	-3.4
-4.2	-2.7	0.1
-0.5	0.3	0.9
0.5	0.6	0.9
0.4	0.5	0.9
0.5	0.8	0.9
0.8	0.8	0.9
0.9	1.4	1.4
1.1	1.3	1.6

100'
TRANSITIC
RGE. VARIE



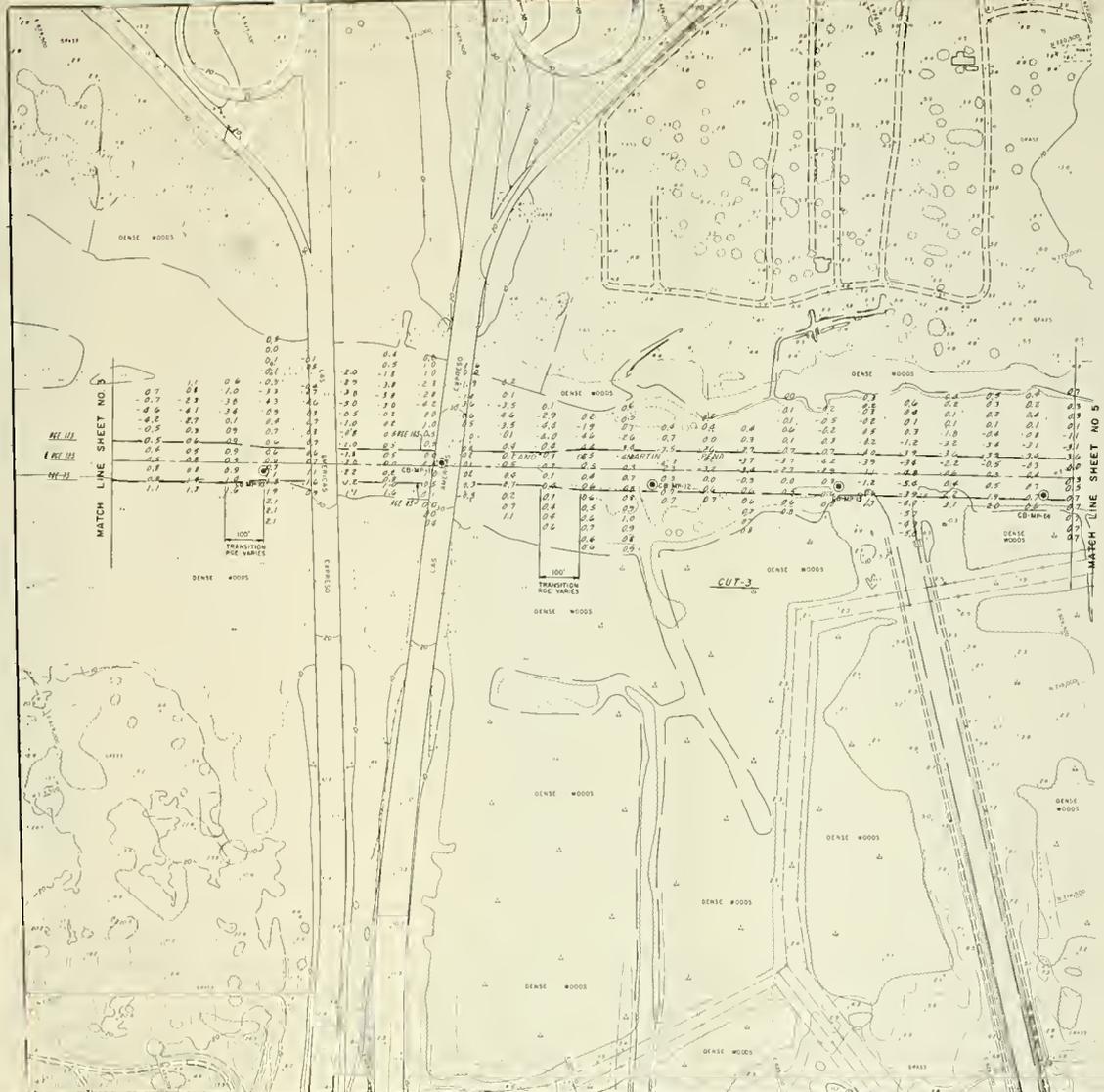
NOTE:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.



DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA			
SAN JUAN, PUERTO RICO			
AGUA-GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION CHANNEL (PLAN I)			
PLAN			
DESIGN ENG.	INV. NO.	SIZE	DWG. NO.
OWN. BY	CRD. BY	F	
DATED	SCALE: AS SHOWN	DATED:	SHEET 4

SAFETY ON THIS JOB
DEPENDS ON YOU

REVISIONS		DATE	APPROVED
NO.	BY/DATE		



MATCH LINE SHEET NO. 5
 SHEET NO. 111
 SHEET NO. 112
 SHEET NO. 113

0.8	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8
0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8
0.5	0.3	0.9	0.7	0.3	0.1	0.4	0.7	1.0	1.3	1.6	1.9
0.5	0.6	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1

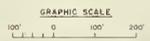
100'
 TRANSITION
 SEE VARIES

100'
 TRANSITION
 SEE VARIES

MATCH LINE SHEET NO. 3
 SHEET NO. 113
 SHEET NO. 114
 SHEET NO. 115

CUT-3

NOTE
 SEE SHEETS 1 & 2 FOR NOTES AND LEGEND



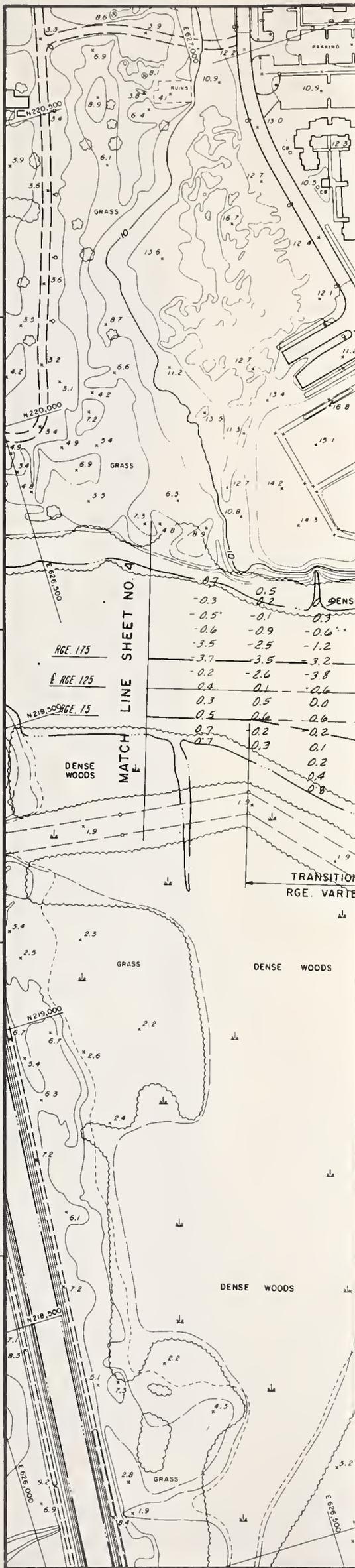
DEPARTMENT OF THE ARMY
 JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
 JACKSONVILLE, FLORIDA
 SAN JUAN, PUERTO RICO
AGUA-GUAGUA PROJECT
 DREDGING MARTIN PENA NAVIGATION
 CHANNEL (PLAN 2)
 PLAN

DATE	BY	NO.	DATE	NO.

SCALE AS SHOWN (DATE) SHEET 6

ON THIS JOB
HANDS ON YOU

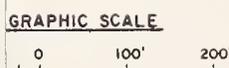
REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		



0.7	0.5	0.2
-0.3	-0.1	-0.3
-0.5	-0.9	-0.6
-3.5	-2.5	-1.2
-3.7	-3.5	-3.2
-0.2	-2.6	-3.8
0.4	0.1	-2.6
0.3	0.5	0.0
0.5	0.6	0.6
0.7	0.2	0.2
0.7	0.3	0.1
		0.2
		0.4
		0.8



NOTE:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.

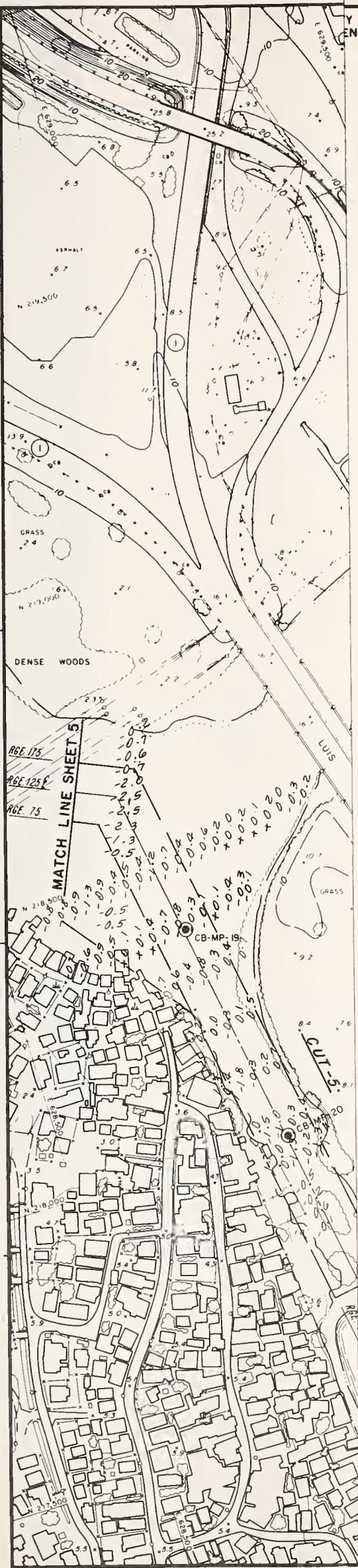


DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO			
AGUA-GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION CHANNEL (PLAN I) PLAN			
DESIGN NO.:	INV. NO.	SIZE	DWG. NO.
OWN. BY:	CRD. BY:	F	
DATED:		DATED:	
SCALE: AS SHOWN		SHEET 5	

Y ON THIS JOB
ENDS ON YOU

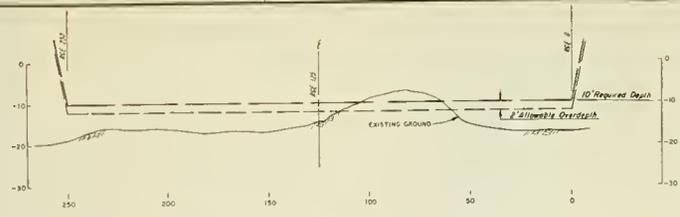
REVISIONS

NO.	SYM	ZONE	DATE	APPROVED

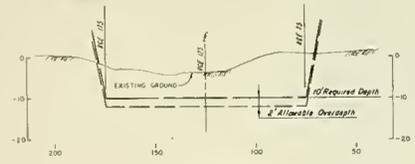


SAFETY ON THIS JOB
DEPENDS ON YOU

NO.	DATE	DESCRIPTION	DATE	APPROVED



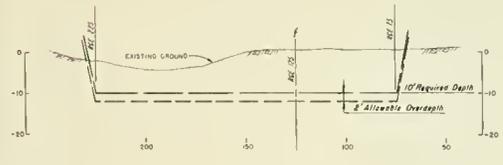
CUT-1



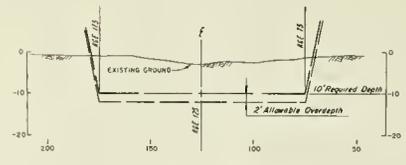
CUT-2



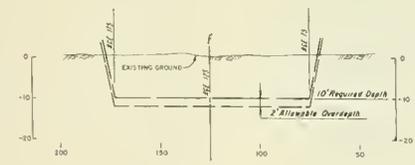
CUT-3



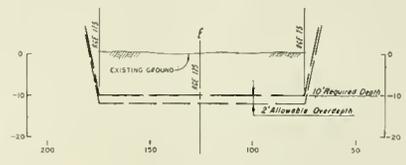
CUT-3



CUT-4



CUT-3



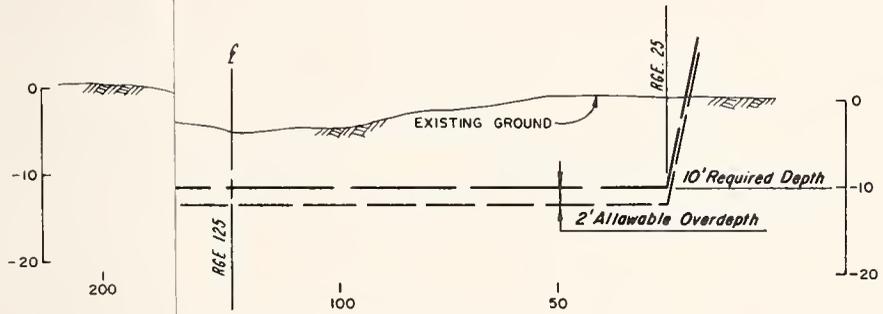
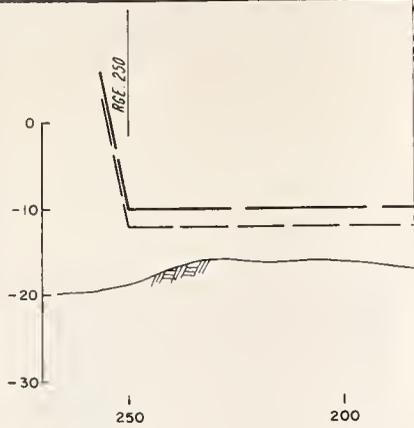
CUT-5

DEPARTMENT OF THE ARMY
 JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
 JACKSONVILLE, FLORIDA
 SAN JUAN, PUERTO RICO
AQUA-GUAGUA PROJECT
 DREDGING MARTIN PENA NAVIGATION
 CHANNEL (PLAN II)
 SECTIONS

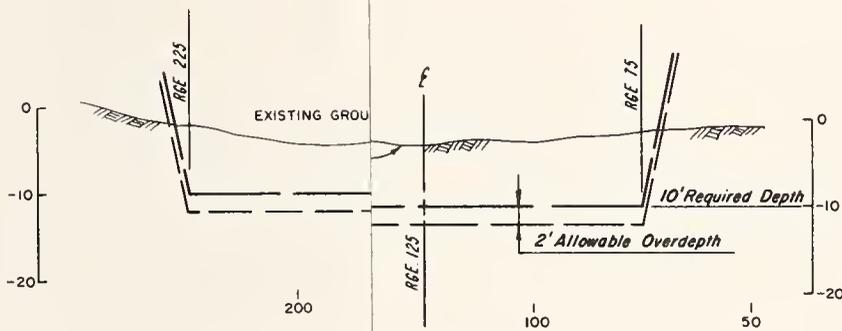
DESIGNED BY G.A.M.	CHECKED BY F
SCALE: AS SHOWN	DATED
SHEET 7	

IN THIS JOB
S ON YOU

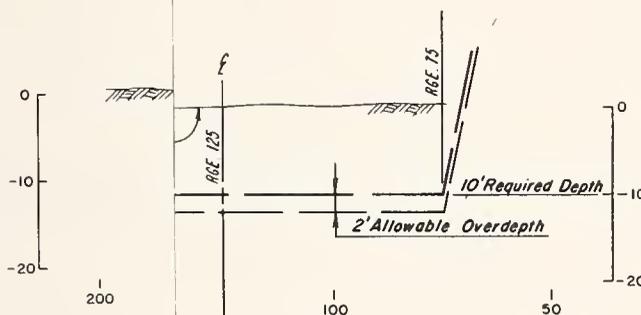
REVISIONS				DATE	APPROVED
NO.	SYM	ZONE	DESCRIPTION		



CUT-3



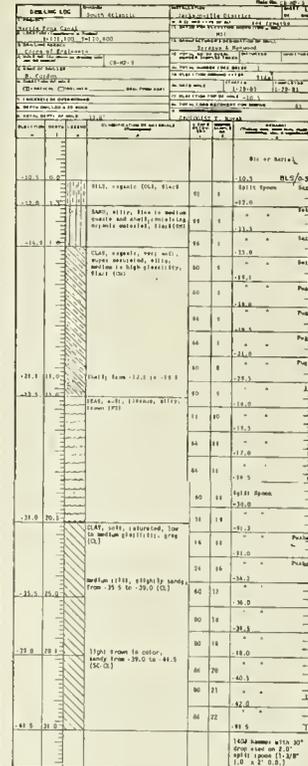
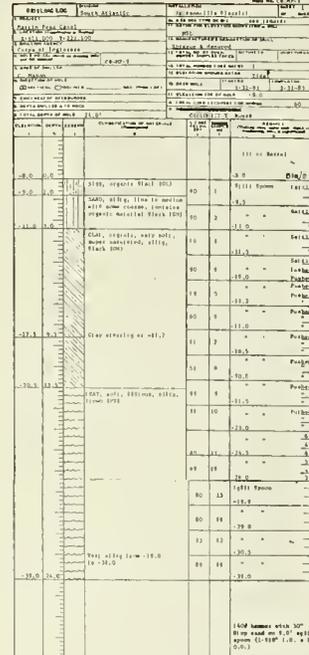
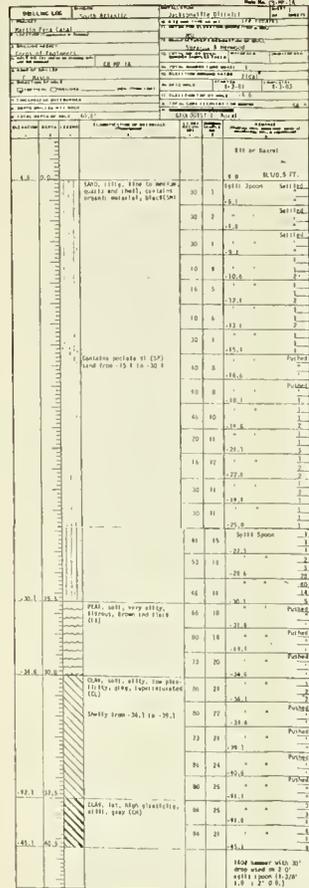
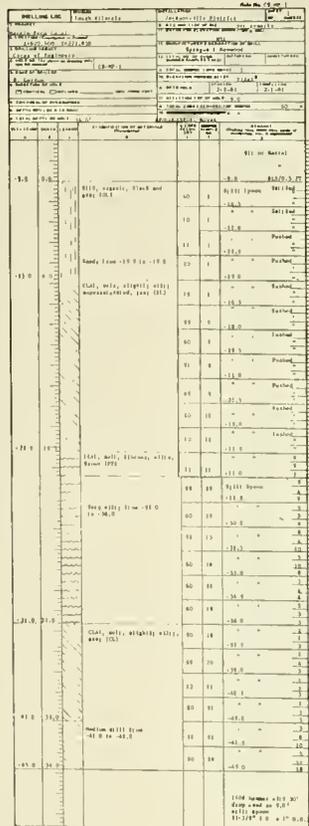
CUT-4



CUT-5

DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO			
AGUA - GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION CHANNEL (PLAN I)			
SECTIONS			
DWN. BY	G. A. M.	SIZE	8 1/2" x 11"
CD. BY			
SCALE: AS SHOWN	DATED:	SHEET 7	

NO	DATE	REVISIONS		APPROVED
		DESCRIPTION	DATE	



IN THIS JOB
S ON YOU

REVISIONS				DATE	APPROVED
NO	SYM	ZONE	DESCRIPTION		

DRILLING LOG		Division	SPALLA
PROJECT		South Atlantic	Jack
1. PROJECT			10. BEE A
2. LOCATION (Coordinates or Station)			11. BEVEN
X=620,600 Y=221,450			12. MANUA
3. DRILLING AGENCY			13. TOTAL
Corps of Engineers			14. BOUND
4. HOLE NO. (As shown on drawing title and file number)		CB-MP-1	15. TOTAL
5. NAME OF DRILLER			16. ELEV
R. Gordon			17. DATE
6. DIRECTION OF HOLE			18. ELEV
<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		ONE FROM VERT.	19. DATE
7. THICKNESS OF OVERBURDEN			20. TOTAL
8. DEPTH DRILLED INTO ROCK			21. BOUND
9. TOTAL DEPTH OF HOLE		36.0'	22. ELEV
			23. BOUND
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OR MATERIALS (Description)
-9.0	0.0		SILT, organic, black and gray (OL)
-15.0	6.0		Sandy from -13.5 to -15.0 CLAY, soft, slightly silty supersaturated, gray (CL)
-25.5	16.5		PEAT, soft, fibrous, silty, brown (PT)
-36.0	27.0		Very silty from -33.0 to -36.0
-42.0	33.0		CLAY, soft, slightly silty, gray (CL)
-45.0	36.0		Medium stiff from -42.0 to -45.0

DRILLING LOG		Division	INSTALLATION	SHEET		
PROJECT		South Atlantic	Jacksonville District	1		
1. PROJECT			see remarks			
2. LOCATION (Coordinates or Station)			MSI			
X=621,400 Y=220,800						
3. DRILLING AGENCY			MANUFACTURER'S DESIGNATION OR DRILL			
Corps of Engineers			Sprague & Henwood			
4. HOLE NO. (As shown on drawing title and file number)		CB-MP-3	16. TOTAL NO. OF OVER-BOUNDER SAMPLES TAKEN			
5. NAME OF DRILLER			17. TOTAL NUMBER CORE BONES	1		
R. Gordon			18. ELEVATION GROUND WATER	Tidal		
6. DIRECTION OF HOLE			19. DATE HOLE STARTED	1-28-83		
<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		ONE FROM VERT.	20. DATE HOLE COMPLETED	1-28-83		
7. THICKNESS OF OVERBURDEN			21. ELEVATION TOP OF HOLE	-10.5		
8. DEPTH DRILLED INTO ROCK			22. TOTAL CORE RECOVERY FOR BORING	61		
9. TOTAL DEPTH OF HOLE		33.0'	23. GEOLOGIST	T. Novak		
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OR MATERIALS (Description)	SCORE RECOVERY	SAMPLE NO.	REMARKS (Dialing time, water level, depth of overburden, etc., if applicable)
-10.5	0.0					Bit or Barrel
-12.0	1.5		SILT, organic (OL), black	30	1	Split Spoon Settle
-14.5	4.0		SAND, silty, fine to medium quartz and shell, containing organic material, black (SK)	46	2	" " Settle
-16.5	6.0		CLAY, organic, very soft, super saturated, silty, medium to high plasticity, black (OH)	46	3	" " Settle
-18.0	7.5			60	4	" " Settle
-19.5	9.0			60	5	" " Pushed
-21.0	10.5			66	6	" " Pushed
-22.5	12.0		Shelly from -22.5 to -23.5	66	7	" " Pushed
-23.5	13.0		PEAT, soft, fibrous, silty, brown (PT)	60	8	" " Pushed
-24.0	13.5			40	9	" " Pushed
-25.5	15.0			73	10	" " Pushed
-27.0	16.5			66	11	" " Pushed
-28.5	18.0			66	12	" " Pushed
-30.0	19.5			60	13	Split Spoon Pushed
-31.5	21.0		CLAY, soft, saturated, low to medium plasticity, gray (CL)	53	14	" " Pushed
-33.0	22.5			46	15	" " Pushed
-34.5	24.0		medium stiff, slightly sandy, from -35.5 to -39.0 (CL)	26	16	" " Pushed
-36.0	25.5			60	17	" " Pushed
-37.5	27.0			80	18	" " Pushed
-39.0	28.5		light brown in color, sandy from -39.0 to -43.5 (SC-CL)	80	19	" " Pushed
-40.5	30.0			86	20	" " Pushed
-42.0	31.5			80	21	" " Pushed
-43.5	33.0			86	22	" " Pushed
						140# hammer with 30" drop used on 2.0' split spoon (1-3/8" I.O. x 2" O.O.)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO
AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN-1)
CORE BORING LOGS

DWR. BY	SIZE	DRW. NO.
CD. BY	F	
SCALE: AS SHOWN DATED:		SHEET 8

ON THIS JOB
S ON YOU

REVISIONS				DATE	APPROVED
NO.	SYM	ZONE	DESCRIPTION		

DRILLING LOG		Division	INSTALLATION	Sheet
PROJECT		South Atlantic	Jacksonville	1 of 2 SHEETS
LOCATION (Coordinates or Station)				
DRILLING AGENCY				
NAME OF DRILLER				
DIRECTION OF HOLE				
THICKNESS OF OVERBURDEN				
DEPTH DRILLED INTO ROCK				
TOTAL DEPTH OF HOLE		30.0 ft.		
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	SCORING
-9.4	0.0		SAND, silty, organic, material, black (SP)	26
-10.4	1.0		SILT, organic, black (OL)	40
-12.4	3.0		PEAT, soft, fibrous, very silty, brown (PT)	40
			Wood at -25.9	80
-27.4	18.0		CLAY, soft, occasional wood fiber, slightly silty, gray (CL)	80
			Sandy from -34.9 to -38.4 (SC-CL)	80
-38.4	29.0		Medium stiff from -28.4 to -29.4	73

DRILLING LOG		Division	INSTALLATION	Sheet	
PROJECT		South Atlantic	Jacksonville District	1 of 2 SHEETS	
LOCATION (Coordinates or Station)					
DRILLING AGENCY					
NAME OF DRILLER					
DIRECTION OF HOLE					
THICKNESS OF OVERBURDEN					
DEPTH DRILLED INTO ROCK					
TOTAL DEPTH OF HOLE		39.0'			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	SCORING	REMARKS
-1.0	0.0		SILT, organic, black (OL)	46	Bit or Barrel
			Trace of plastic fines and fibrous material starting at -7.0	40	85/0.5 FT.
			CLAY, very soft, very silty, organic, contains fibrous layers, black and gray (OH)	40	Settled
			CLAY, very soft, super-saturated, slightly silty, gray (CL)	46	Settled
			PEAT, very silty, soft, fibrous, brown (PT)	66	Settled
			CLAY, soft, slightly silty, contains fibrous material, dark gray (CL)	80	Settled
			Light brown in color, medium stiff to stiff with limestone fragments (CL-CH) from -30.0 to +40.0	86	Settled
			very stiff from -33.0 to -40.0	66	Settled
				86	Settled
				80	Settled
				93	Settled
				86	Settled
				40	Settled
				42	Settled
					140# hammer with 30" drop used on 2.0' split spoon (1-3/8" I.D. x 2" O.D.)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN-1)

CORE BORING LOGS

DWN. BY G.A.M.
CD. BY

SCALE: AS SHOWN DATED: SHEET 9

ON THIS JOB
BY YOU

REVISIONS			DATE	APPROVED
NO.	SYM.	ZONE	DESCRIPTION	

DRILLING LOG				DRILLING LOG				DRILLING LOG				
Division: South Atlantic				Division: South Atlantic				Division: South Atlantic				
INSTALLATION: Jacksonville District				INSTALLATION: Jacksonville District				INSTALLATION: Jacksonville District				
PROJECT: Martin Pena Canal				PROJECT: Martin Pena Canal				PROJECT: Martin Pena Canal				
LOCATION: (Continent or Station)				LOCATION: (Continent or Station)				LOCATION: (Continent or Station)				
DRILLING AGENCY: Corps of Engineers				DRILLING AGENCY: Corps of Engineers				DRILLING AGENCY: Corps of Engineers				
HOLE NO. (As shown on drawing sheet and file number): CB-MP-8				HOLE NO. (As shown on drawing sheet and file number): CB-MP-11				HOLE NO. (As shown on drawing sheet and file number): CB-MP-11				
NAME OF DRILLER: R. Gordon				NAME OF DRILLER: C. Mason				NAME OF DRILLER: T. Novak				
DIRECTION OF HOLE: <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED				DIRECTION OF HOLE: <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED				DIRECTION OF HOLE: <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED				
DATE OF DRILLING: 2-15-83				DATE OF DRILLING: 2-15-83				DATE OF DRILLING: 2-15-83				
TOTAL DEPTH OF HOLE: 37.5'				TOTAL DEPTH OF HOLE: 39.0 FT.				TOTAL DEPTH OF HOLE: 39.0 FT.				
GEOLOGIST: I.				GEOLOGIST: I.				GEOLOGIST: T. Novak				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Described)	S. CORE RECOVERY (%)	SAMPLE NO.	ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Described)	S. CORE RECOVERY (%)	SAMPLE NO.	REMARKS (Drilling time, water flow, depth of penetration, etc., if applicable)
+0.7	0.0		SILT, soft, highly organic, black (OL)	30	1	+1.0	0.0		SILT, soft, organic black and gray (OL)	46	1	8L5/0.5 FT. Bit or Barrel
				40	2					53	2	Split Spoon Settled
				46	3					46	3	-0.5 " " Settled
				40	4					53	4	-2.0 " " Settled
				46	5					40	5	-3.5 " " Settled
				46	6					53	6	-5.0 " " Settled
				53	7					46	7	-6.5 " " Settled
				46	8					53	8	-8.0 " " Settled
				53	9					46	9	-9.5 " " Settled
				46	10					53	10	-11.0 " " Settled
				53	11					46	11	-12.5 " " Settled
				46	12					53	12	-14.0 " " Settled
				53	13					46	13	-15.5 " " Settled
				46	14					53	14	-17.0 " " Settled
				53	15					46	15	-18.5 " " Settled
				46	16					53	16	-20.0 " " Settled
				53	17					46	17	-21.5 " " Settled
				46	18					53	18	-23.0 " " Pushed
				53	19					46	19	-24.5 " " Pushed
				46	20					53	20	-26.0 " " Pushed
				53	21					46	21	-27.5 " " Pushed
				46	22					53	22	-29.0 " " -3
				53	23					46	23	-30.5 " " -6
				46	24					53	24	-32.0 " " -12
				53	25					46	25	-33.5 " " -10
				46	26					53	26	-35.0 " " -20
				53	27					46	27	-36.5 " " -14
				46	28					53	28	-38.0 " " -10
				53	29					46	29	-38.0 " " -15
				46	30					53	30	-38.0 " " -20

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN - I)
CORE BORING LOGS

DWN. BY: G A M
CED. BY: F

SCALE: AS SHOWN
DATED: _____
SHEET 10

NO	SYM	CODE	DESCRIPTION	REVISIONS	
				DATE	APPROVED

Sheet No. 28 of 32

DIBLING LOG	DEPTH	CORRECTIONS	TEST DATA	
			WATER	TEMP
0.0	0.8	Silt, very soft, organic, gray (S)	44	10.0
			51	2
			60	3
			46	4
			53	5
			44	6
			60	7
-13.2	20.2	Silt, very sandy, soft to medium (S), gray (S)	11	8
-17.8	12.8	Silt, silty, silty, occasional shreds (S), gray (S)	60	9
			88	10
			93	11
			86	12
			80	13
			86	14
			80	15
-27.5	12.5	Silt, silty, light gray to white (S)	80	16
			86	17
			80	18
			86	19
			80	20
			86	21
			80	22
			86	23
			80	24
			86	25
			80	26
			86	27
			80	28
			86	29
			80	30
			86	31
			80	32
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			86	89
			80	90
			86	91
			80	92
			86	93
			80	94
			86	95
			80	96
			86	97
			80	98
			86	99
			80	100

Sheet No. 29 of 32

DIBLING LOG	DEPTH	CORRECTIONS	TEST DATA	
			WATER	TEMP
0.0	0.8	Silt, very soft, organic, black (S)	44	10.0
			51	2
			60	3
			46	4
			53	5
			44	6
			60	7
-13.2	20.2	Silt, very sandy, soft to medium (S), gray (S)	11	8
-17.8	12.8	Silt, silty, silty, occasional shreds (S), gray (S)	60	9
			88	10
			93	11
			86	12
			80	13
			86	14
			80	15
-27.5	12.5	Silt, silty, light gray to white (S)	80	16
			86	17
			80	18
			86	19
			80	20
			86	21
			80	22
			86	23
			80	24
			86	25
			80	26
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			80	94
			86	95
			80	96
			86	97
			80	98
			86	99
			80	100

Sheet No. 30 of 32

DIBLING LOG	DEPTH	CORRECTIONS	TEST DATA	
			WATER	TEMP
0.0	0.8	Silt, very soft, organic, black (S)	44	10.0
			51	2
			60	3
			46	4
			53	5
			44	6
			60	7
-13.2	20.2	Silt, very sandy, soft to medium (S), gray (S)	11	8
-17.8	12.8	Silt, silty, silty, occasional shreds (S), gray (S)	60	9
			88	10
			93	11
			86	12
			80	13
			86	14
			80	15
-27.5	12.5	Silt, silty, light gray to white (S)	80	16
			86	17
			80	18
			86	19
			80	20
			86	21
			80	22
			86	23
			80	24
			86	25
			80	26
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			80	48
			86	49
			80	50
			86	51
			80	52
			86	53
			80	54
			86	55
			80	56
			86	57
			80	

ON THIS JOB
5 ON YOU

REVISIONS				DATE	APPROVED
NO.	SYM	ZONE	DESCRIPTION		

DRILLING LOG		DIVISION	INSTALLATION
PROJECT Martin Pena Canal		South Atlantic	Jacksonville District
LOCATION (Coordinates or Station)			
DRILLING AGENCY Corps of Engineers			
HOLE NO. (As shown on drawing title and file number) CB-MP-12			
NAME OF DRILLER C. Mason			
DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED OBS. FROM VERT.			
THICKNESS OF OVERBURDEN			
DEPTH DRILLED INTO ROCK			
TOTAL DEPTH OF HOLE 22.5			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)
0.0	0.0		SILT, very soft, organic, black (OL) Layers of fibrous material between -1.5 and -10.5
-10.5	10.5		CLAY, very sandy, soft to medium stiff, gray (CL-SC)
-12.0	12.0		CLAY, fat, stiff, occasional limestone fragment, slightly sandy, gray with red stains (CH)
-22.5	22.5		Highly stained (red) with numerous rock fragments from -18.5 to -22.5

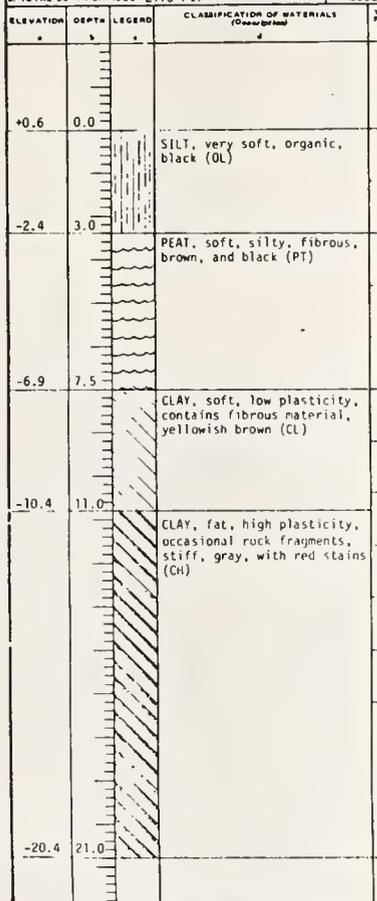
Sheet No. CB-MP-15

DRILLING LOG		DIVISION	INSTALLATION			
PROJECT Martin Pena Canal		South Atlantic	Jacksonville District			
LOCATION (Coordinates or Station)						
DRILLING AGENCY Corps of Engineers						
HOLE NO. (As shown on drawing title and file number) CB-MP-15						
NAME OF DRILLER C. Mason						
DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED OBS. FROM VERT.						
THICKNESS OF OVERBURDEN						
DEPTH DRILLED INTO ROCK						
TOTAL DEPTH OF HOLE 22.5'						
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	DEPTH RECOVERED	REMARKS	
+0.6	0.0		SILT, very soft, highly organic, black (OL)		Bit or Barrel 8 1/2" D. SFT Spilt Spoon Settled	
				30	1	
				46	2	Settled
						-0.9
				40	3	Settled
						-2.4
				66	4	Settled
						-3.9
				53	5	Settled
						-5.4
				53	6	Settled
						-6.9
				40	7	Settled
						-8.4
				40	7	Settled
						-9.9
				46	8	Settled
						-11.4
				80	9	Pushed
						-12.9
				93	10	Settled
						-14.4
				93	11	Settled
						-15.9
				86	12	Settled
						-17.4
				86	13	Settled
						-18.9
				80	14	Settled
						-20.4
				93	15	Settled
						-21.9
						140# hammer with 30" drop used 98-7-0' spilt spoon (1-2-00)

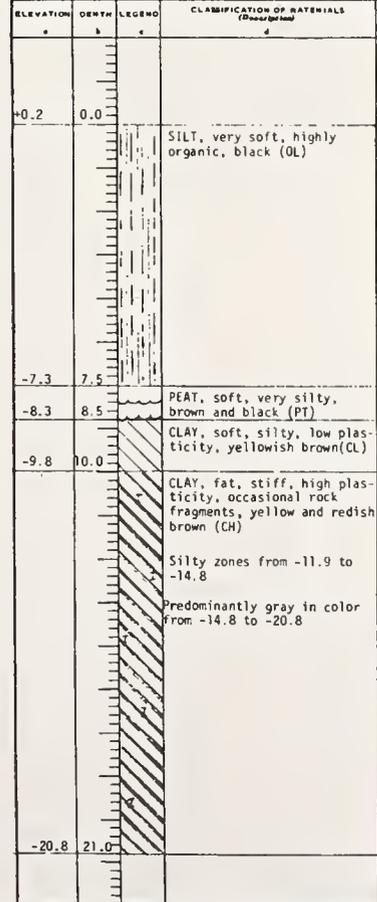
DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA			
SAN JUAN, PUERTO RICO			
AGUA-GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION			
CHANNEL (PLAN-1) CORE BORING LOGS			
DWN. BY G. A. M.	DATE F	SIZE F	DWG. NO.
CRD. BY	SCALE: AS SHOWN	DATED:	SHEET 11

ON THIS JOB
S ON YOU

DIVISION South Atlantic		INSTALLATION Jacks
PROJECT Martin Pena Canal		NO. SHEET 11
LOCATION (Coordinate or Station)		DATE
DRILLING AGENCY Corps of Engineers		TOTAL BORING
HOLE NO. (As shown on drawing title and this number)		TOTAL
NAME OF DRILLER C. Mason		ELEVATION
DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DATE
THICKNESS OF OVERBURDEN		ELEVATION
DEPTH DRILLED INTO ROCK		TOTAL
TOTAL DEPTH OF HOLE 21.0 Ft.		GEOL

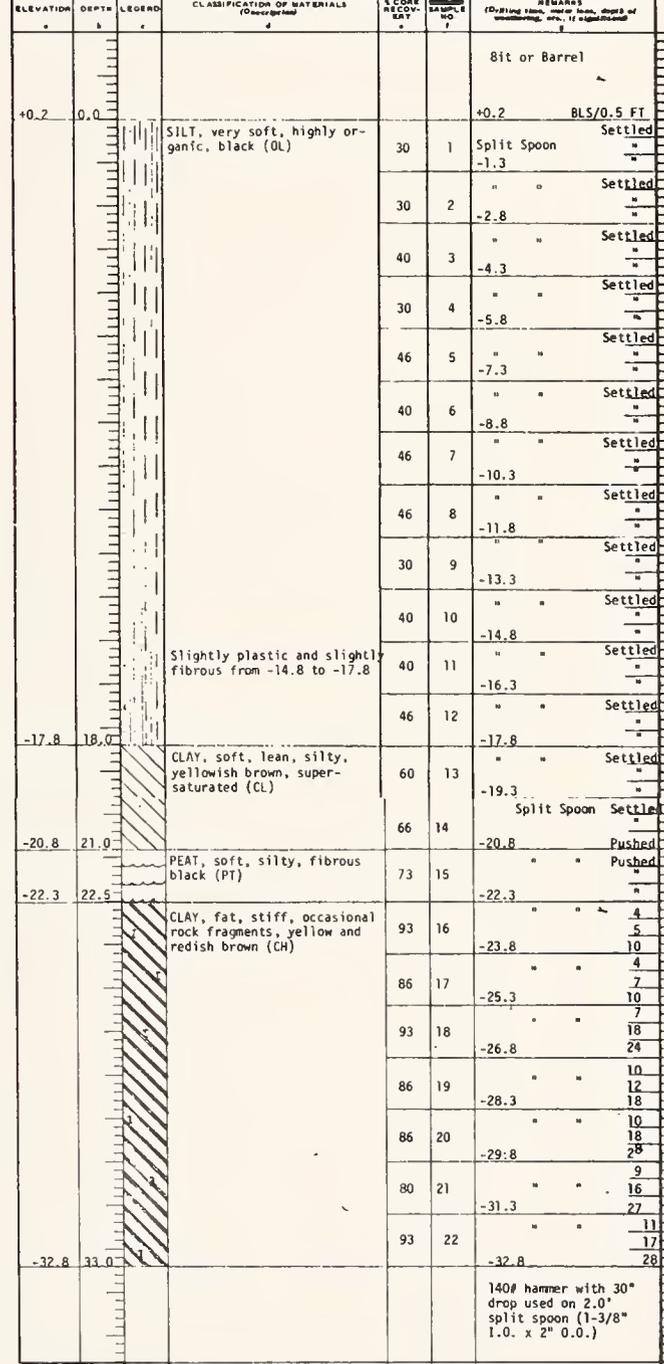


DIVISION South Atlantic		INSTALLATION Jacks
PROJECT Martin Pena Canal		NO. SHEET 12
LOCATION (Coordinate or Station)		DATE
DRILLING AGENCY Corps of Engineers		TOTAL BORING
HOLE NO. (As shown on drawing title and this number)		TOTAL
NAME OF DRILLER C. Mason		ELEVATION
DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DATE
THICKNESS OF OVERBURDEN		ELEVATION
DEPTH DRILLED INTO ROCK		TOTAL
TOTAL DEPTH OF HOLE 21.0'		GEOL



REVISIONS				DATE	APPROVED
NO.	SYM	ZONE	DESCRIPTION		

DIVISION South Atlantic		INSTALLATION Jacks
PROJECT Martin Pena Canal		NO. SHEET 12
LOCATION (Coordinate or Station)		DATE
DRILLING AGENCY Corps of Engineers		TOTAL BORING
HOLE NO. (As shown on drawing title and this number)		TOTAL
NAME OF DRILLER C. Mason		ELEVATION
DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DATE
THICKNESS OF OVERBURDEN		ELEVATION
DEPTH DRILLED INTO ROCK		TOTAL
TOTAL DEPTH OF HOLE 33.0'		GEOL



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN-I)
CORE BORING LOGS

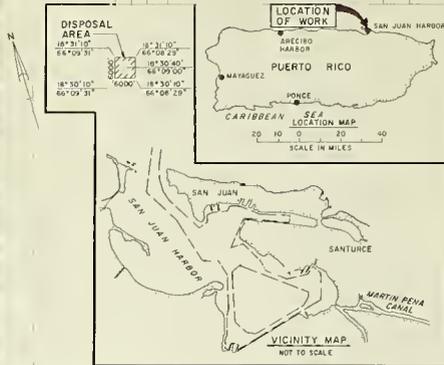
OWN. BY _____ SIZE DWG. NO. _____
 CDD. BY _____ F

SCALE: AS SHOWN DATED: _____ SHEET 12



SAFETY ON THIS JOB
DEPENDS ON YOU

NO. 5747001 REVISIONS DATE APPROVED



- NOTES:
- HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO USC & GS STATION MORRO LN (CCC TUSE), USING SECOND ORDER, CLASS II ACCURACY STANDARDS.
 - VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NGS TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U.S. NAVY RESERVATION (MC NGS 955390 DATED 24 MAR 1971). ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MEAN ELEVATION OF NGS 8 M. NO. 13, 1965 IS 0.5 FEET ABOVE MEAN SEA LEVEL. THIS MEAN SEA LEVEL WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL. IN THE PROJECT, MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 27 MONTHS OF RECORDS, APRIL 1962 - DECEMBER 1963, REDUCED TO MEAN VALUES.
 - PHOTOGRAPHING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1963 BY RILEY, PARK, HARTON & ASSOCIATES (ATLANTA, GA.) AND SOUTHERN RESOURCE MAPPING CORP., (DORLAND BEACH, FL).
 - PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1963, AT A NEGATIVE SCALE OF 1" = 500'.
 - HIGH ALTITUDE AIR PHOTOGRAPHY WAS FLOWN ON 28 JAN 1963 AT A NEGATIVE SCALE OF 1" = 2000'.
 - PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION, BY SOUTHERN RESOURCE MAPPING CORP., DURING FEB - MAR 1963.
 - MAP MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
 - CONTOUR INTERVAL 2 FEET.
 - ARCHIVED DATA SOURCES:
PHOTOGRAPHY - PUERTO RICO, MARTIN PENA CANAL, DATED 28 JAN 1963
FIELD BOOKS - PUERTO RICO FIELD BOOKS 2, 24, 25, 26 AND 27, DATED 1963
 - GRID COORDINATES ARE BASED ON Lambert PLANE RECTANGULAR SYSTEM FOR PUERTO RICO 1959 ADJUSTMENT.
 - STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDER STATIONING.
 - ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (+) SIGN.
 - SEE SHEET NO. 2 FOR LEGEND.

GRAPHIC SCALE
400' 0 400' 800'

DESIGNED BY	DATE	DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO AGUA-GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION CHANNEL PLAN #2 LOCATION AND INDEX
DRAWN BY	DATE	
CHECKED BY	DATE	
SCALE AS SHOWN	DATE	

SCALE AS SHOWN DATE SHEET 1 OF

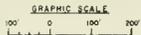
SAFETY ON THIS JOB
DEPENDS ON YOU

REVISIONS		DATE	APPROVED
NO.	DESCRIPTION		

LEGEND

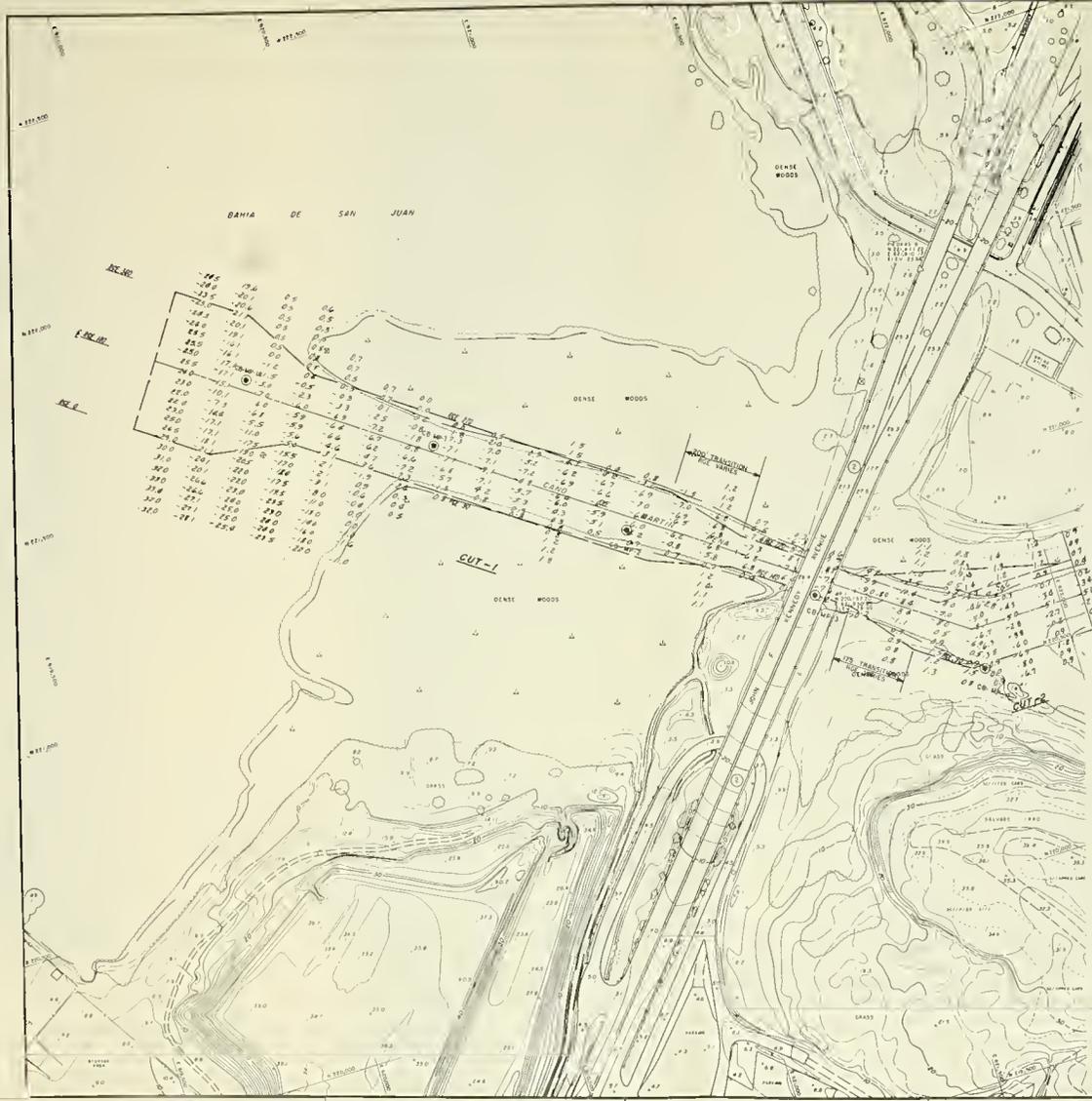
- BUILDINGS
- ROADS
- DRIVE, PARKING AREA
- GUARD RAIL
- FENCE
- POWER LINE
- TOWER
- POLE
- LIGHT POLE
- MANHOLE
- SIGN
- FIRE HYDRANT
- VALVE
- CATCH BASIN
- CONTOURS
- DEPRESSION CONTOURS
- TREE CLUSTER
- PALM TREE
- WATER
- SWAMP
- HORIZONTAL CONTROL
- SPOT ELEVATION
- PROJECT CHANNEL
- AREA TO BE DREDGED
- DISPOSAL AREA
- SOUNDING AND LOCATION
- CORE BORING LOCATION AND DESIGNATION

NOTES - SEE SHEET A FOR NOTES.
SEE PLAN E FOR CORE BORING LOGS



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
344 QUAM, PAVES RICO
AQUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN 3)

DATE	BY	CHKD.	APP'D.
SCALE: 1" = 100'	DATE:	SHEET 8 OF 8	

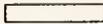
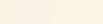
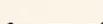
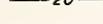
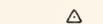
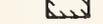


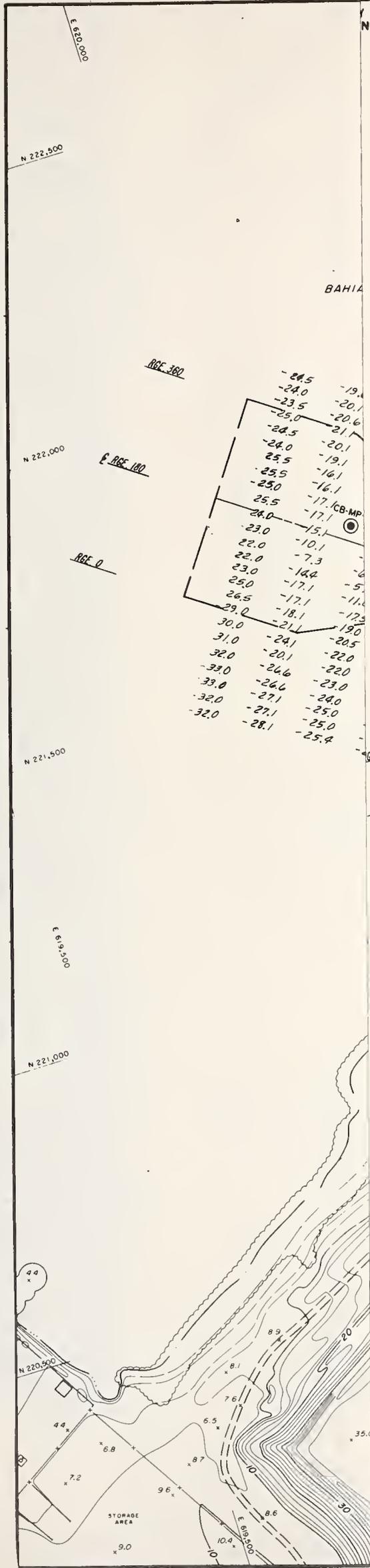
ON THIS JOB
ANDS ON YOU

REVISIONS

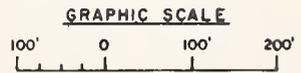
NO.	SYM	ZONE	DATE	APPROVED

LEGEND

-  BUILDINGS
-  ROADS
-  DRIVE, PARKING AREA
-  GUARD RAIL
-  FENCE
-  POWER LINE
-  TOWER
-  POLE
-  LIGHT POLE
-  MANHOLE
-  SIGN
-  FIRE HYDRANT
-  VALVE
-  CATCH BASIN
-  CONTOURS
-  DEPRESSION CONTOURS
-  TREE CLUSTER
-  PALM TREE
-  WATER
-  SWAMP
-  HORIZONTAL CONTROL
-  SPOT ELEVATION
-  PROJECT CHANNEL
-  AREA TO BE DREDGED
-  DISPOSAL AREA
-  SOUNDING AND LOCATION
-  CORE BORING LOCATION AND DESIGNATION



NOTES: SEE SHEET 1 FOR NOTES.
SEE PLAN I FOR CORE BORINGS LOGS.

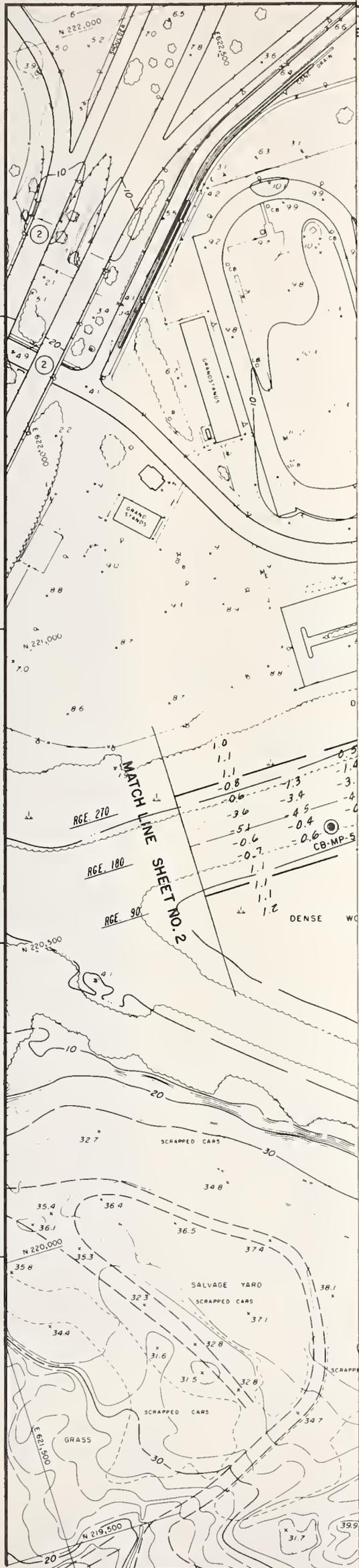


DEPARTMENT OF THE ARMY			
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS			
JACKSONVILLE, FLORIDA			
SAN JUAN, PUERTO RICO			
AQUA - GUAGUA PROJECT			
DREDGING MARTIN PENA NAVIGATION			
CHANNEL (PLAN II)			
PLAN			
DESIGNED BY:	DRAWN BY:	REV. NO.	DATE
SCALE: AS SHOWN		DATED:	SHEET 2 OF 2

BY ON THIS JOB
ENDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



NOTE 1. SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND.
2. SEE PLAN I FOR CORE BORING LOGS.

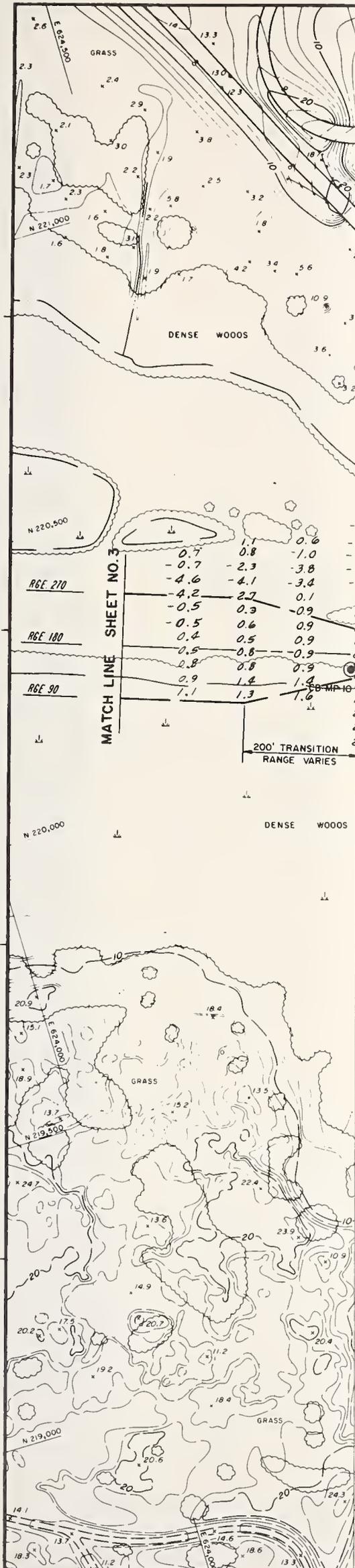


DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO			
AQUA - GUAGUA PROJECT DREDGING MARTIN PENA NAVIGATION CHANNEL (PLAN I) PLAN			
DESIGNER:	CHK. BY:	ENV. NO.	SIZE
			F
DATED:		DATED:	
SCALE: AS SHOWN		SHEET 3 OF	

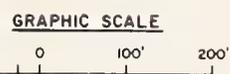
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ENDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



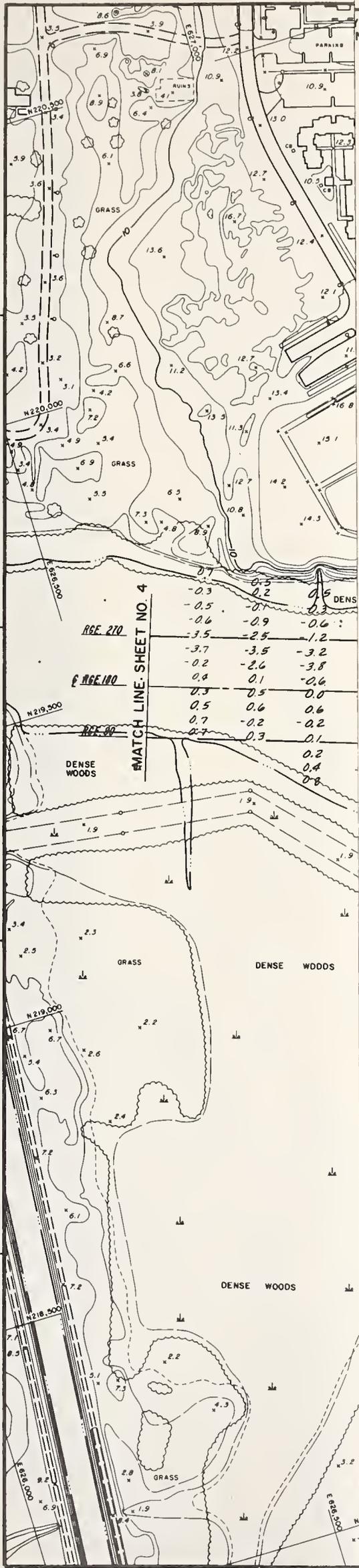
NOTE:
1.) SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
2.) SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENNA NAVIGATION
CHANNEL (PLAN II)
PLAN

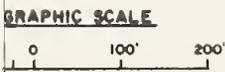
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			F	
DATE:		SCALE: AS SHOWN		
		DATED:		SHEET 4



ON THIS JOB
ENDS ON YOU

REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		

NOTES:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN II)
PLAN

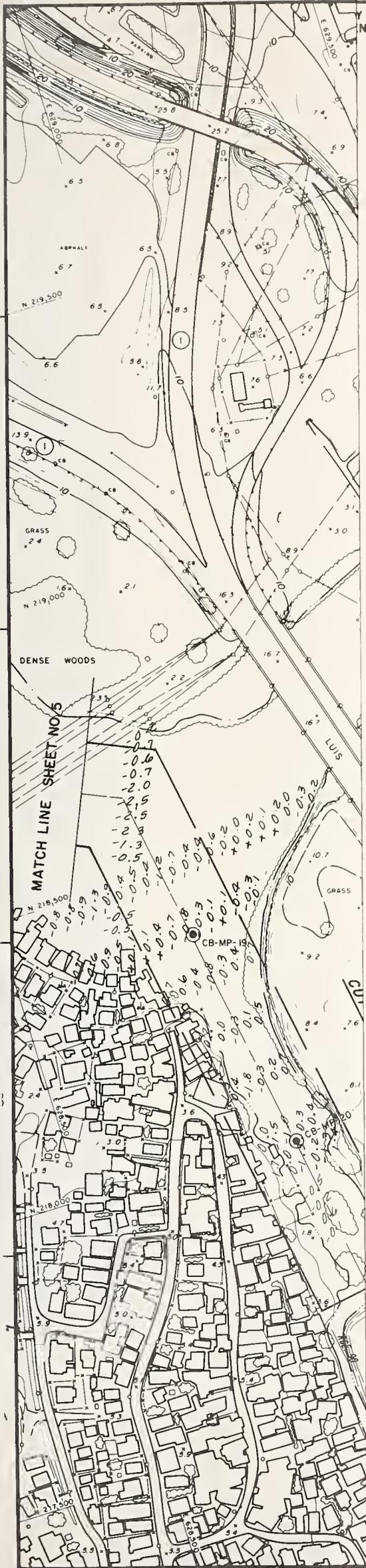
DESIGNED BY:	DRAWN BY:	CHKD BY:	DATE:

SCALE: AS SHOWN DATED: SHEET 6

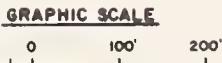
BY ON THIS JOB
ANDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



NOTE:
1. SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
2. SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA - GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN II)

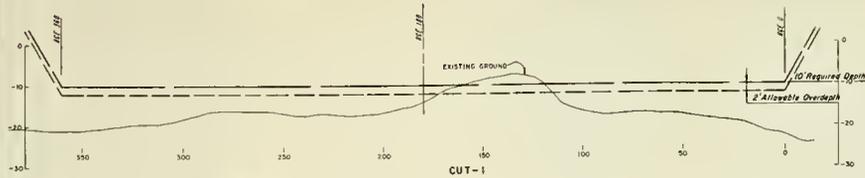
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NO. 1	NO. 2	NO. 3	NO. 4

SCALE: AS SHOWN DATED: SHEET: 1

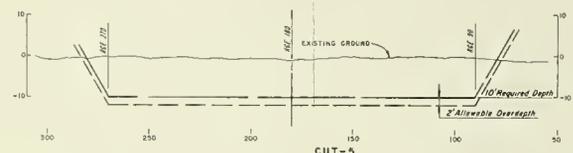
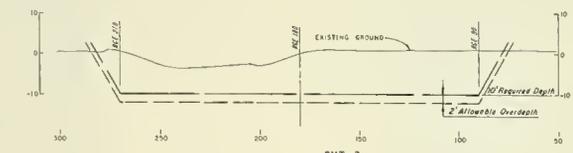
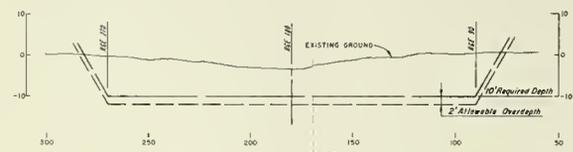
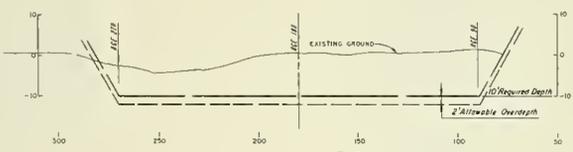
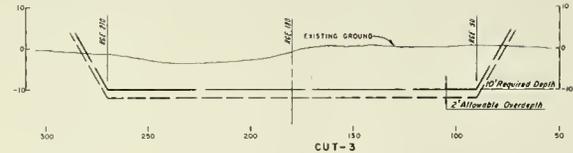
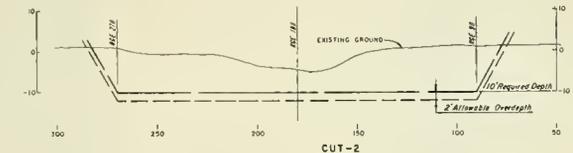
SAFETY ON THIS JOB
DEPENDS ON YOU

NO.		DATE	REVISIONS	DATE	APPROVED



ELEVATION IN FEET — MEAN LOW WATER

ELEVATION IN FEET — MEAN LOW WATER

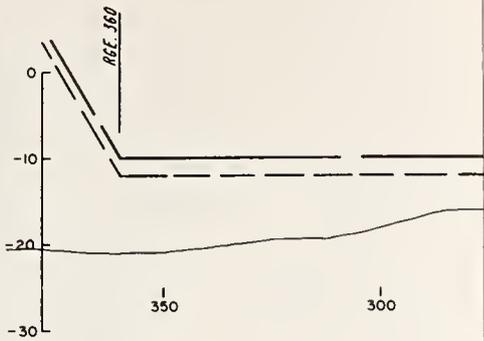


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
SAN JUAN, PUERTO RICO
AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN 27)

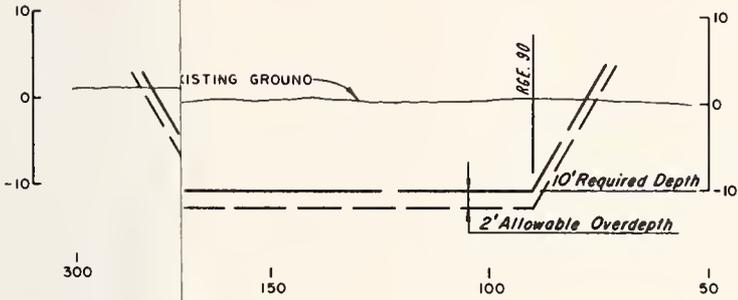
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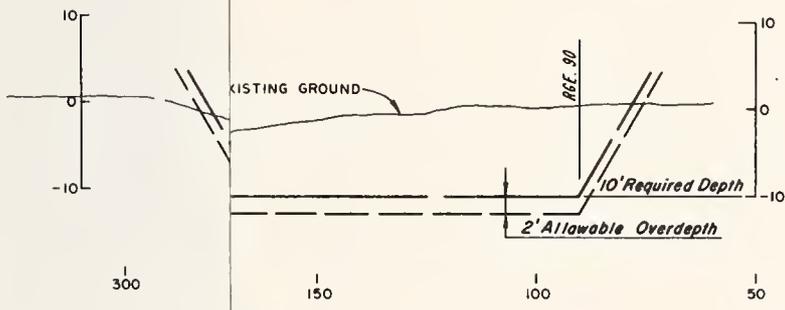
REVISIONS				DATE	APPROVED
NO.	SYM	ZONE	DESCRIPTION		



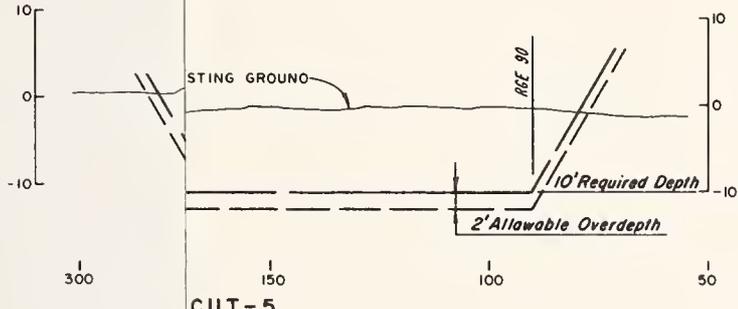
ELEVATION IN FEET - MEAN LOW WATER



CUT-3



CUT-4



CUT-5

ELEVATION IN FEET - MEAN LOW WATER

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

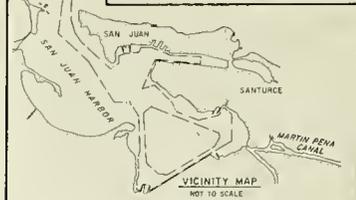
AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN II)

SECTIONS

DWN. BY G.A.M.	SIZE F	DWG. NO.
CKD. BY	SCALE: AS SHOWN	DATED: SHEET

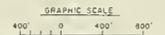
SAFETY ON THIS JOB
DEPENDS ON YOU

NO. 5141/ZONE _____ REVISIONS _____ DATE APPROVED _____

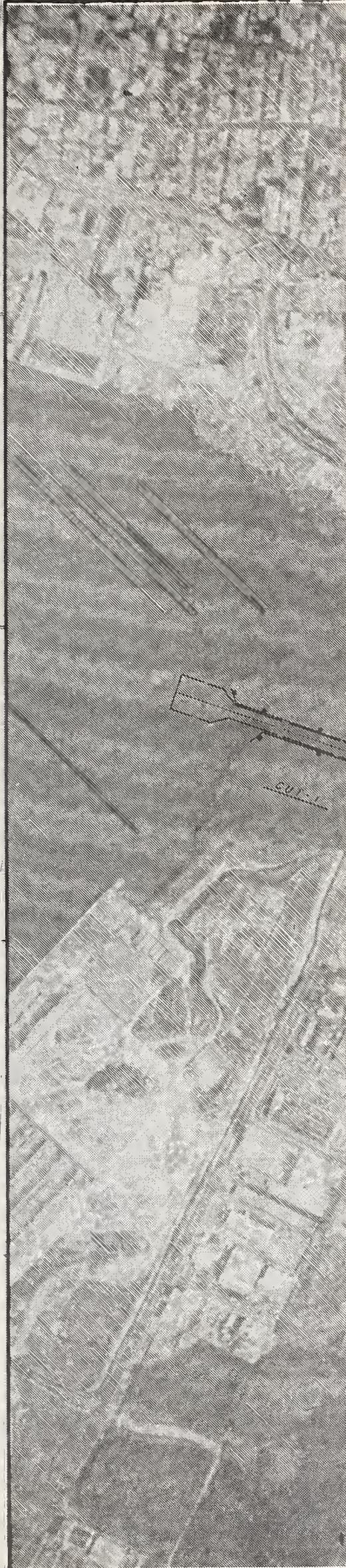


NOTES

1. HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO U.S. & G.S. STATION MORRO LEMEC (USE), USING SECOND ORDER, CLASS 1 ACCURACY STANDARDS.
2. VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE MDS, 110M BENCHMARK CLUSTER (LOCATED AT THE FORMER U.S. NAVY RESERVATION) ARE, NOS. 075-5310 DATED 28 MAR 1971. ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE M.W. ELEVATION OF NOS. 8.M. 110 13 1965 (11 02) FEET ABOVE MEAN SEA LEVELS WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL. IN THE PROJECT, MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1967-DECEMBER 1967 REDUCED TO MEAN VALUES.
3. PHOTOGRAPHIC CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1963 BY RILEY, PARK, HAYDEN & ASSOCIATES (HAYDEN, CH. 1 AND SOUTHERN RESOURCE MAPPING CORP. JORRMO BEACH, FL).
4. PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN ON 26 JAN 1963, AT A NEGATIVE SCALE OF 1" = 50'.
5. HIGH ALTITUDE AIR PHOTOGRAPHY WAS FLOWN ON 28 JAN 1963, AT A NEGATIVE SCALE OF 1" = 2000'.
6. PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STRIP PHOTOGRAPHY, BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1963.
7. ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
8. CONTOUR INTERVAL 2 FEET.
9. ARCHIVED DATA SOURCES:
PHOTOGRAPHY - PUERTO RICO, MARTIN PEÑA CANAL, DATED 28 JAN 1963
FIELD BOOKS - PUERTO RICO FIELD BOOKS 23, 24, 25, 26 AND 27, DATED 1963
10. GRID COORDINATES ARE BASED ON LAMBERT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO 1959 ADJUSTMENT.
11. STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDER STATIONING.
12. ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (+) SIGN.
13. SEE SHEET NO. 2 FOR LEGEND.

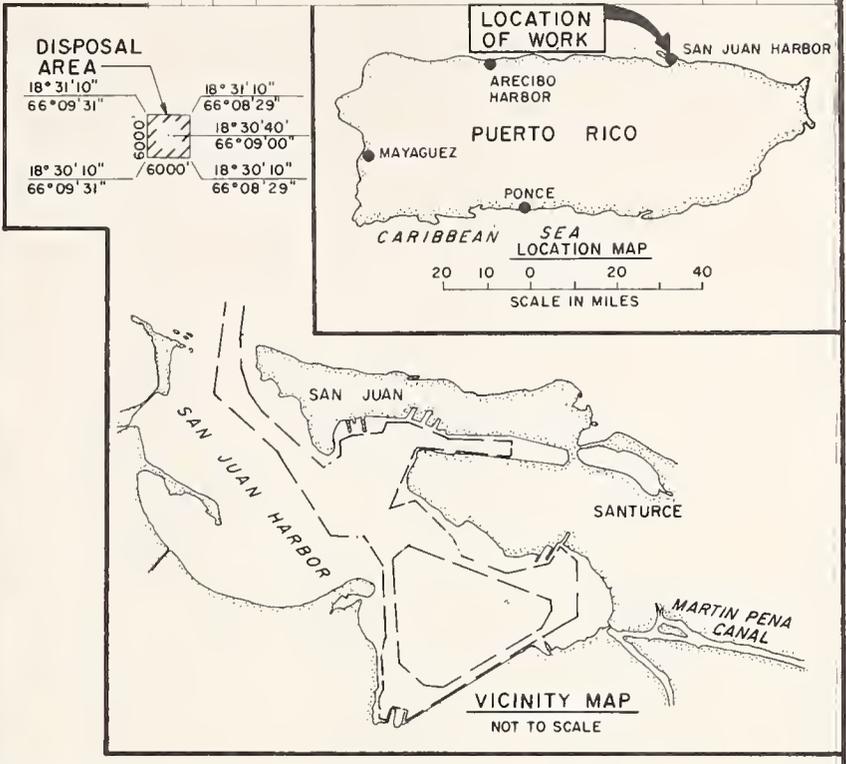


DRAWN BY _____ CHECKED BY _____ DATE _____ SCALE AS SHOWN	DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO AGUA-GUAGA PROJECT DREDGING MARTIN PEÑA NAVIGATION CHANNEL (PL. 44) 203 LOCATION AND INDEX SHEET NO. _____ DATE _____ SCALE AS SHOWN DATED _____ SHEET 1 OF 8
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TY ON THIS JOB
ENDS ON YOU

NO. SYM ZONE			REVISIONS	
NO.	SYM	ZONE	DATE	APPROVED



HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO USC & GS STATION MORRO L/H ECC (USE), USING SECOND ORDER, CLASS II ACCURACY STANDARDS.

VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NOS, TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U. S. NAVY RESERVATION. (IRE: NOS. 975-537D, DATED 24 MAR 1971). ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MLW ELEVATION OF NOS. B. M. NO. 13, 1965 (11.025 FEET ABOVE MEAN SEA LEVEL) WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL IN THE PROJECT. MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1962 - DECEMBER 1963 REDUCED TO MEAN VALUES.

PHOTOMAPPING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1983 BY RILEY, PARK, HAYDEN & ASSOCIATES (ATLANTA, GA.) AND SOUTHERN RESOURCE MAPPING CORP. (ORMOND BEACH, FL).

PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 550'.

HIGH ALTITUDE AIR PHOTOMAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 2000'.

PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION, BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1983.

ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
 CONTOUR INTERVAL 2 FEET.

ARCHIVED DATA SOURCES:
 PHOTOGRAPHY: PUERTO RICO, MARTIN PENA CANAL, DATED 28 JAN 1983.
 FIELD BOOKS: PUERTO RICO FIELD BOOKS 23, 24, 25, 26 AND 27, DATED 1983.

GRID COORDINATES ARE BASED ON LAMBERT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO 1979 ADJUSTMENT.

STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDENER STATIONING.

ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (-) SIGN.
 SEE SHEET NO. 2 FOR LEGEND.



PREPARED BY:	DEPARTMENT OF THE ARMY
CHIEF, LEVEE & WATERWAYS SECTION	JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
SUBMITTED BY:	JACKSONVILLE, FLORIDA
ENGINEER DESIGN DRAWN:	SAN JUAN, PUERTO RICO
APPROVAL RECOMMENDED:	AGUA-GUAGUA PROJECT
CHIEF, ENGINEERING DIVISION	DREDGING MARTIN PENA NAVIGATION
APPROVED:	CHANNEL (PLAN III)
COL. C. E. DISTRICT ENGINEER	LOCATION AND INDEX
DWN BY: <i>Dwb</i>	INV. NO.
CD BY:	SIZE DWG. NO.
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	DATED
	SCALE: AS SHOWN
	DATEO:
	SHEET 1 OF 6

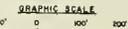
SAFETY ON THIS JOB
DEPENDS ON YOU

NO.	DESCRIPTION	REVISIONS	DATE	APPROVED

LEGENO

- BUILDINGS
- ROADS
- DRIVE, PARKING AREA
- GUARD RAIL
- FENCE
- POWER LINE
- TOWER
- POLE
- LIGHT POLE
- MANHOLE
- STATION
- FIRE HYDRANT
- VALVE
- CATCH BASIN
- CONTOURS
- DEPRESSION CONTOURS
- TREE CLUSTER
- PALM TREE
- WATER
- SWAMP
- HORIZONTAL CONTROL
- SPOT ELEVATION
- PROJECT CHANNEL
- AREA TO BE DREDGED
- DISPOSAL AREA
- SOUNDING AND LOCATION
- CORE BORING LOCATION AND DESIGNATION
- BULKHEAD

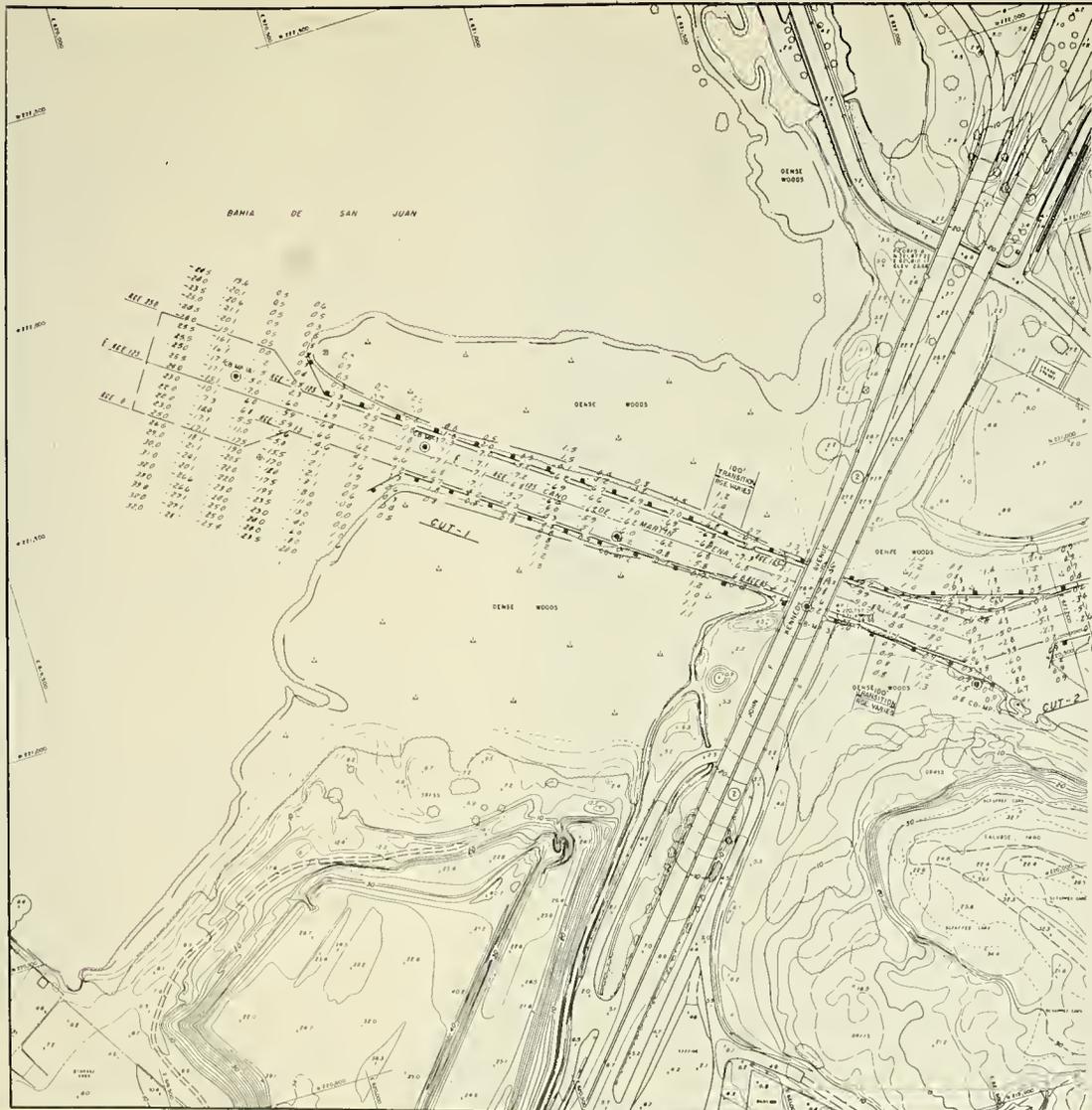
NOTES SEE SHEET 1 FOR NOTES.
SEE SHEET 3 FOR BULKHEAD SECTION
SEE PLAN 2 FOR CHANNEL SECTIONS AND
CORE BORING LOGS



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO
AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN 02)

NO.	REV.	DATE	BY	CHKD.

SCALE: AS SHOWN



MATCH LINE SHEET NO. 5

ON THIS JOB
HANDS ON YOU

REVISIONS

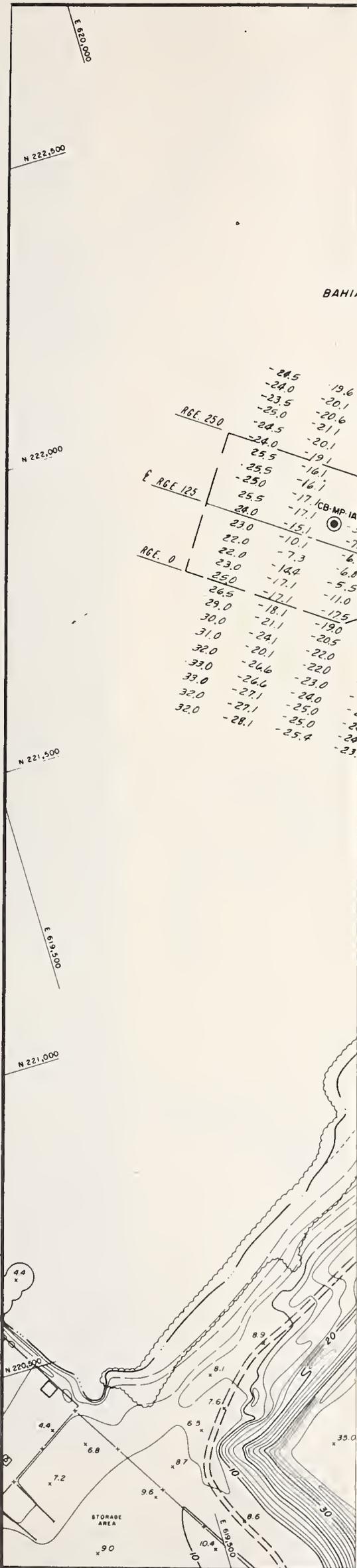
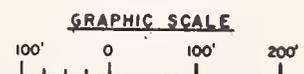
NO.	SYMBOL	ZONE	DATE	APPROVED

LEGEND

- BUILDINGS
- ROADS
- DRIVE, PARKING AREA
- GUARD RAIL
- FENCE
- POWER LINE
- TOWER
- POLE
- LIGHT POLE
- MANHOLE
- SIGN
- FIRE HYDRANT
- VALVE
- CATCH BASIN
- CONTOURS
- DEPRESSION CONTOURS
- TREE CLUSTER
- PALM TREE
- WATER
- SWAMP
- HORIZONTAL CONTROL
- SPOT ELEVATION
- PROJECT CHANNEL
- AREA TO BE DREDGED
- DISPOSAL AREA
- SOUNDING AND LOCATION
- CORE BORING LOCATION AND DESIGNATION
- BULKHEAD



NOTES: SEE SHEET 1 FOR NOTES.
SEE SHEET 3 FOR BULKHEAD SECTION.
SEE PLAN I FOR CHANNEL SECTIONS AND
CORE BORING LOGS.

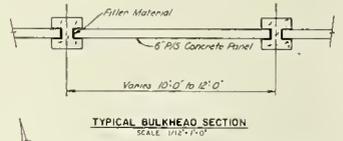
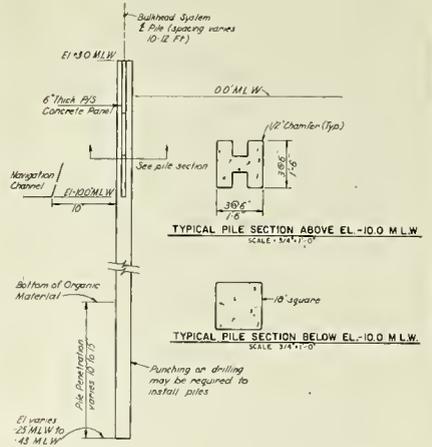
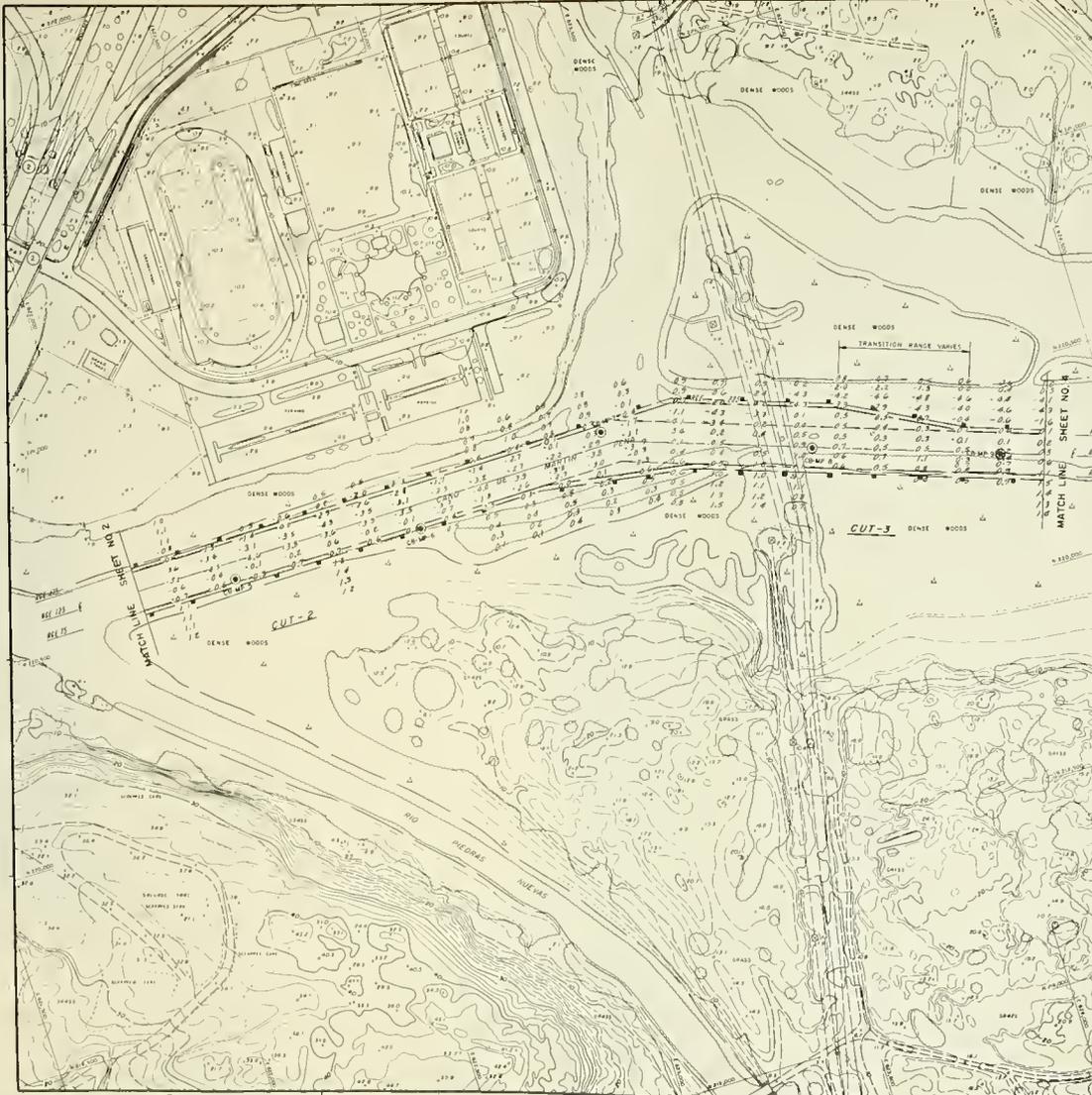


SHEET NO. 3

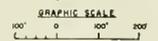
DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA SAN JUAN, PUERTO RICO			
AQUA-GUAGUA PROJECT			
DREDGING MARTIN PENA NAVIGATION			
CHANNEL (PLAN III)			
PLAN			
DATE:	SCALE:	DATE:	SCALE:

SAFETY ON THIS JOB
DEPENDS ON YOU

REVISIONS		DATE APPROVED
NO.	DESCRIPTION	



NOTES SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND.
SEE PLAN 1 FOR CORE BORING LOGS AND CHANNEL SECTIONS.



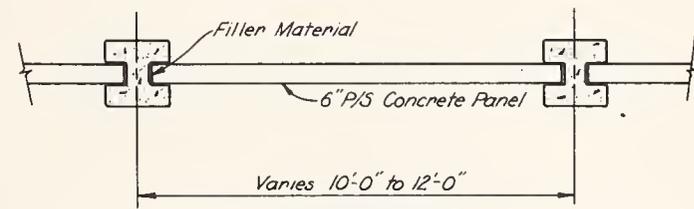
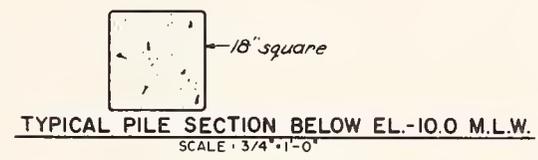
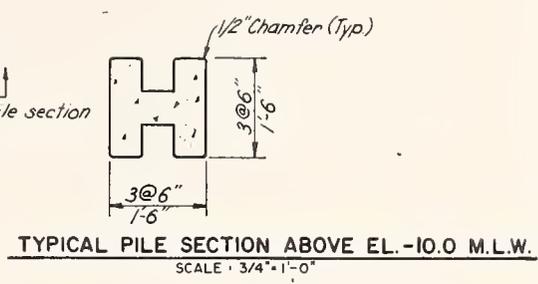
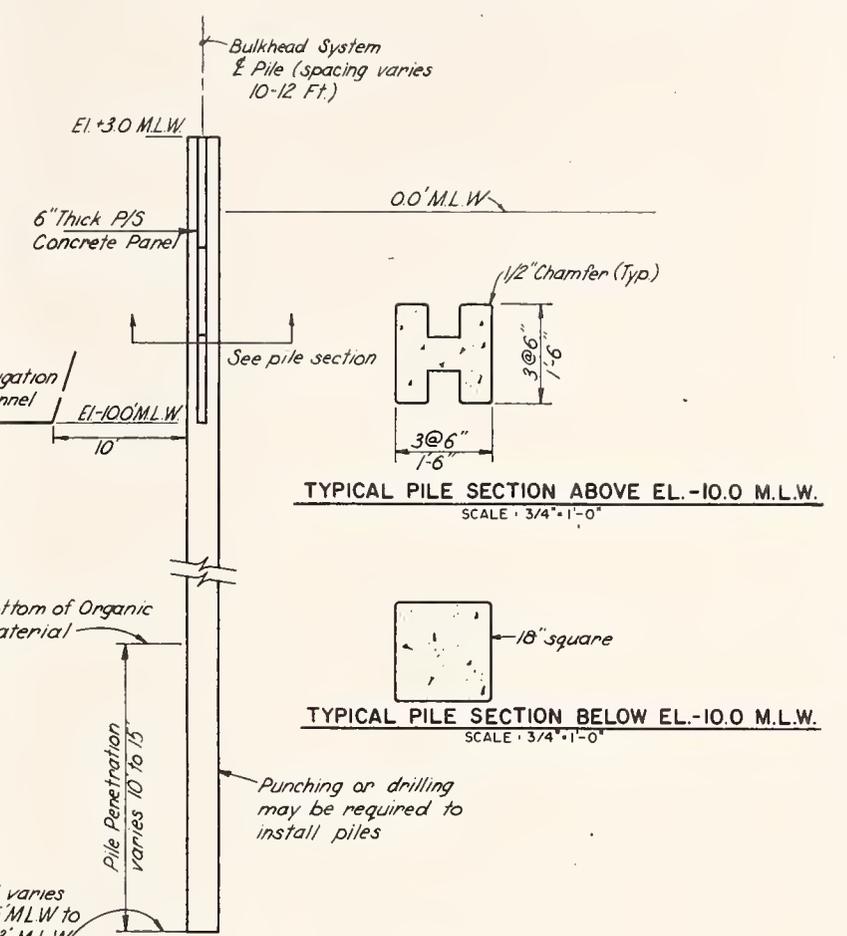
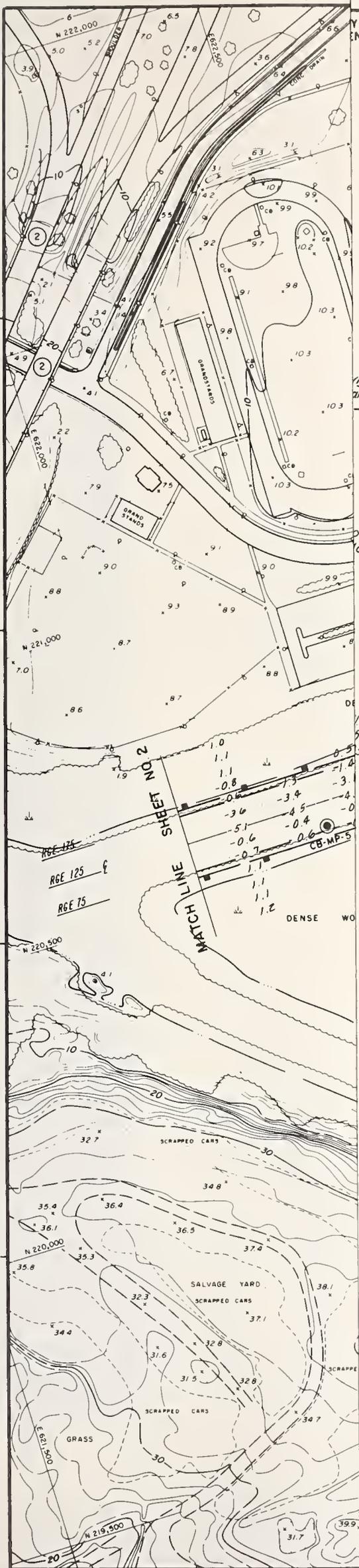
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA-GUAOUA PROJECT
DREGGIO MARTIN PENA NAVIGATION
CHANNEL (PLAN III)

DATE	PLANNED BY
DESIGNED BY	PLANNED BY
CHECKED BY	DATE
SCALE: 1/2" = 1'-0"	SHEET 11

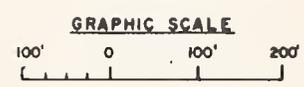
WORK ON THIS JOB
DEPENDS ON YOU

REVISIONS				DATE	APPROVED
NO.	SYM	ZONE			



TYPICAL BULKHEAD SECTION
SCALE: 1/12" = 1'-0"

NOTES: SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND.
SEE PLAN I FOR CORE BORING LOGS AND CHANNEL SECTIONS



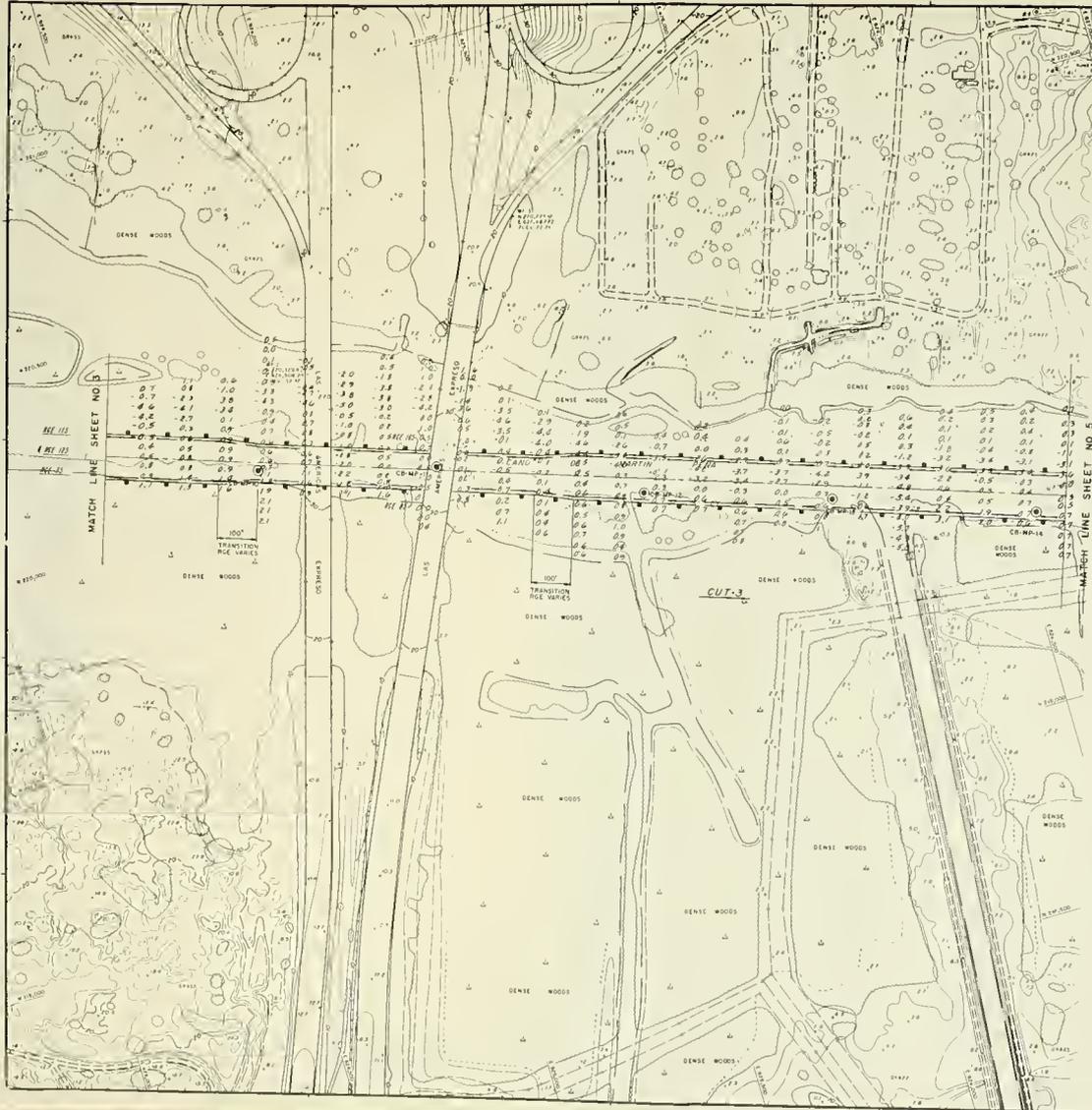
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN III)
PLAN

DATE:	BY:
SCALE: AS SHOWN	DATED:

SAFETY ON THIS JOB
DEPENDS ON YOU

NO.	DATE	REVISIONS	DATE APPROVED



MATCH LINE SHEET NO 3
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MATCH LINE SHEET NO 5

NOTES:
1. SEE SHEETS 1 & 2 FOR NOTES AND LEGEND
2. SEE SHEET 3 FOR BULKHEAD SECTIONS.
3. SEE PLAN 1 FOR CORE BORING LOC.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN 222)

PLAN

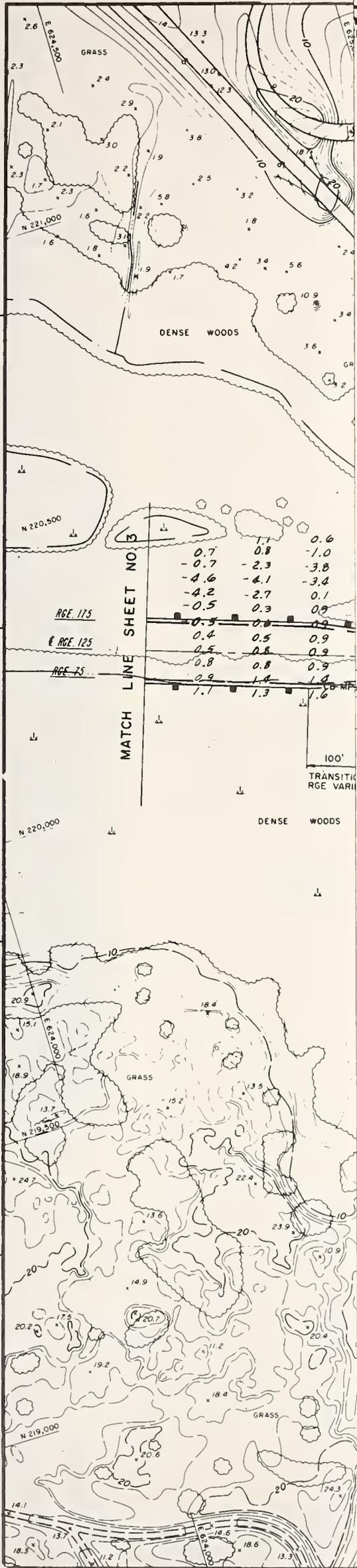
DATE: _____ DRAWN BY: _____

SCALE: AS SHOWN DATE: _____ SHEET: 6

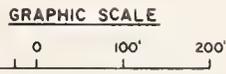
ON THIS JOB
ANDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



- NOTES:
 1. SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
 2. SEE SHEET 3 FOR BULKHEAD SECTIONS.
 3. SEE PLAN I FOR CORE BORING LOGS.

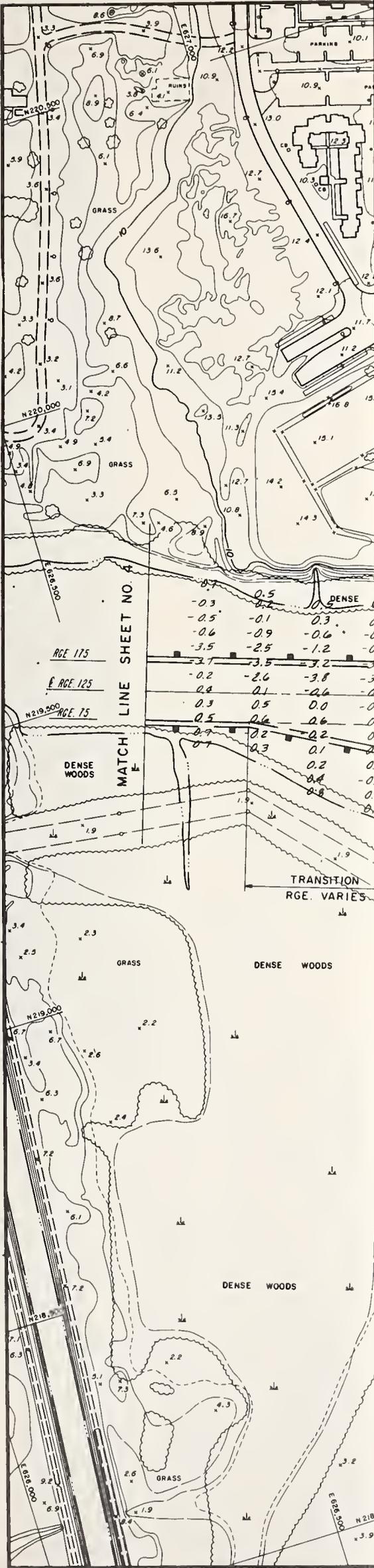


DEPARTMENT OF THE ARMY
 JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
 JACKSONVILLE, FLORIDA
 SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
 CHANNEL (PLAN III)
 PLAN

REV. NO.	DATE	APPROVED

SCALE: AS SHOWN DATED: SHEET 4



THIS JOB ON YOU

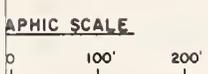
REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		

MATCH LINE SHEET NO. 4

0.5	0.2	DENSE
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0.5	0.6	-0.6
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NOTE:
 SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
 SEE SHEET 3 FOR BULKHEAD SECTIONS.
 SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
 JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
 JACKSONVILLE, FLORIDA
 SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION

CHANNEL (PLAN III)
 PLAN

DESIGNER	CHKD. BY	INV. NO.	SIZE	DWG. NO.
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DATED	SCALE: AS SHOWN		DATED:	SHEET 5



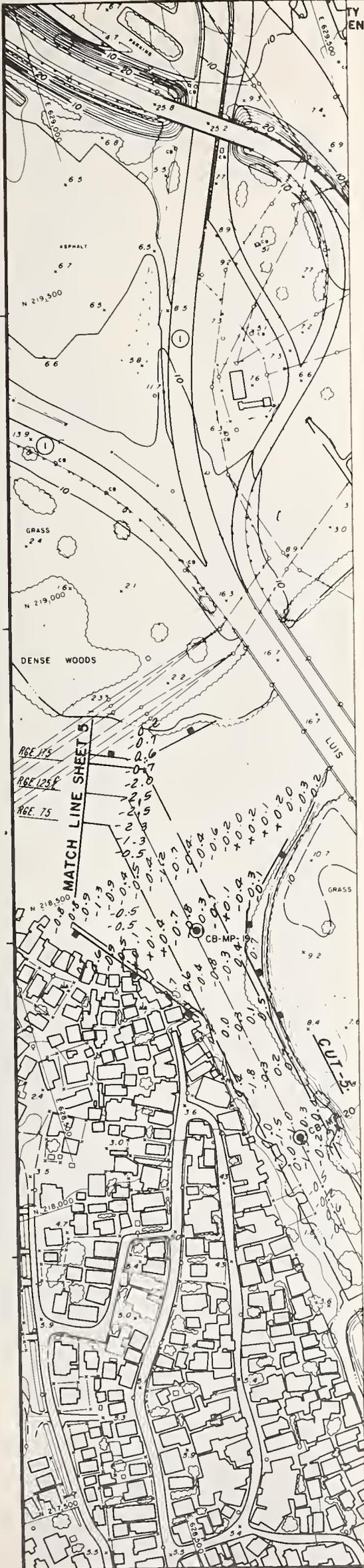
Fold-out Placeholder

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TY ON THIS JOB
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REVISIONS

NO.	SYM	ZONE	DATE	APPROVED



NOTES:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
SEE SHEET 3 FOR BULKHEAD SECTION
SEE PLAN I FOR CORE BORING LOG

GRAPHIC SCALE



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

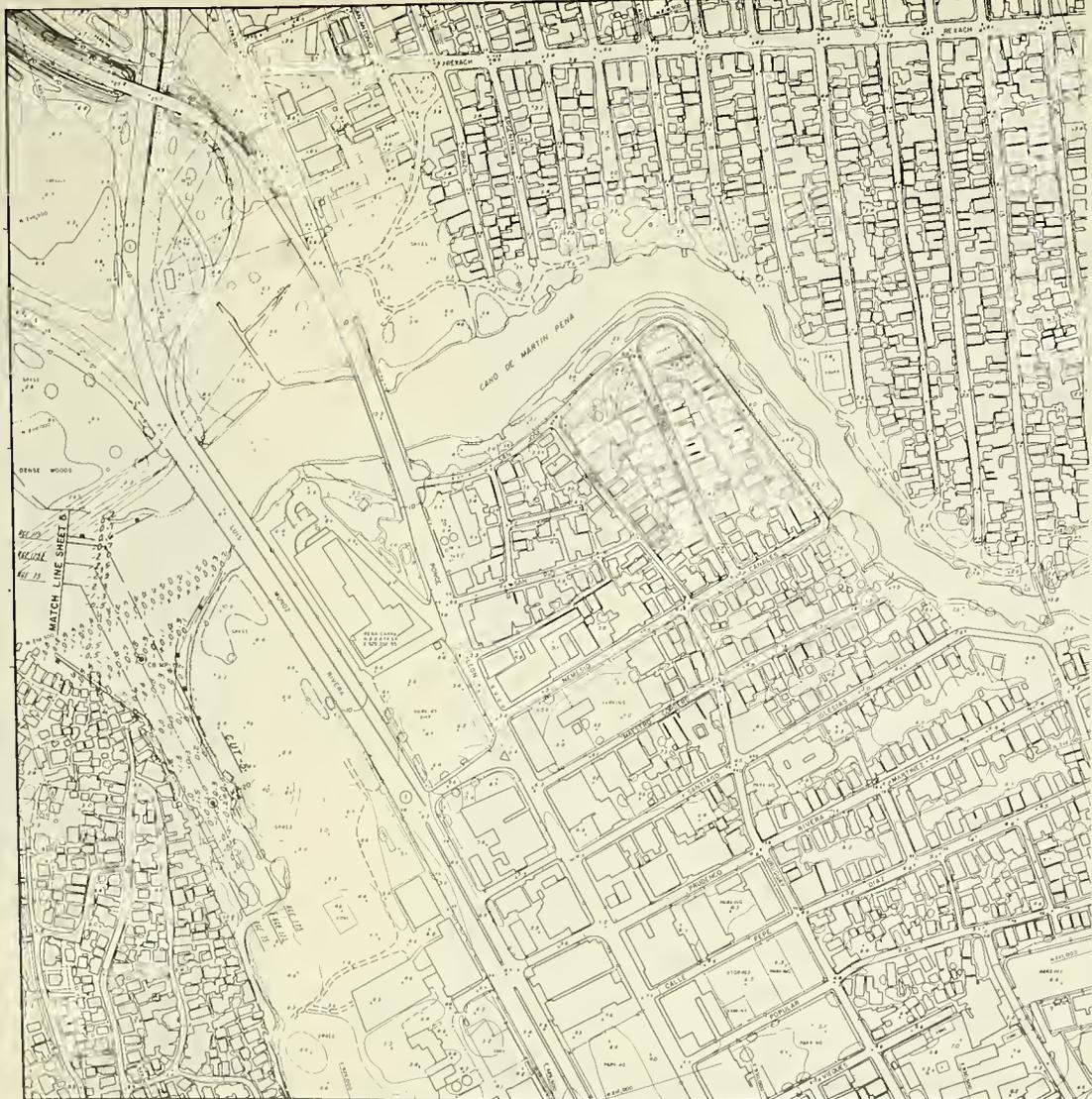
SAN JUAN, PUERTO RICO

AGUA - GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION

CHANNEL (PLAN III)

PLAN

DESIGNER:	DRAWN BY:	CHECKED BY:	DATE:	SCALE:	SHEET NO.:
				1" = 40' SHOWN	4



SAFETY ON THIS JOB
DEPENDS ON YOU

NO.		REVISIONS	DATE APPROVED
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NOTES:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND
SEE SHEET 3 FOR GROUND SECTION
SEE PLAN 1 FOR CORE BORING LOG



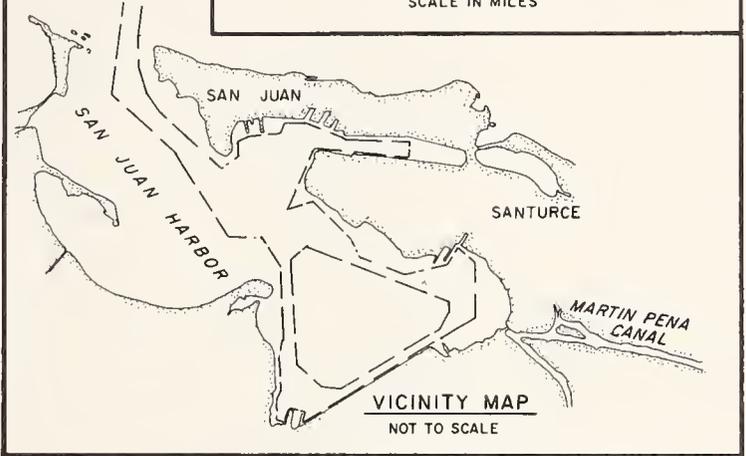
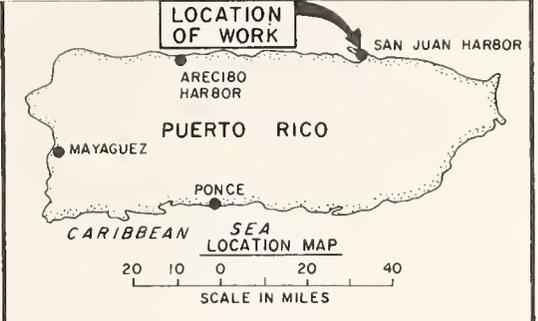
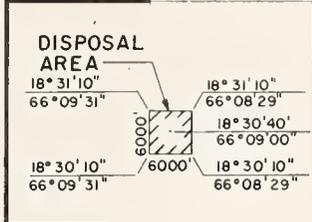
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO
AGUA - GUAGUA PROJECT
DREDGING MARTIN PERA NAVIGATION
CHANNEL (PLAN 20)

DATE	NO.	PLAN	BY
1951	1	PLAN 20	W. B. BAILEY
SCALE - AS SHOWN	DATED	SHEET 8	



BY ON THIS JOB
ENDS ON YOU

REVISIONS			
NO.	SYM	ZONE	DATE APPROVED



S:

HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO USC & GS STATION MORRO L/H ECC (USE), USING SECOND ORDER, CLASS II ACCURACY STANDARDS.

VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NOS. TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U. S. NAVY RESERVATION. (RE: NOS. 975-5370, DATED 24 MAR 1971). ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MLW ELEVATION OF NOS. B. M. NO. 13, 1965 (11.025 FEET ABOVE MEAN SEA LEVEL) WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL IN THE PROJECT. MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1962 - DECEMBER 1963 REDUCED TO MEAN VALUES.

PHOTOMAPPING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1983 BY RILEY, PARK, HAYDEN & ASSOCIATES (ATLANTA, GA.) AND SOUTHERN RESOURCE MAPPING CORP. (ORMOND BEACH, FL).

PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 550'.

HIGH ALTITUDE AIR PHOTOMAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 2000'.

PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION, BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1983.

ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
 CONTOUR INTERVAL 2 FEET.

ARCHIVED DATA SOURCES:
 PHOTOGRAPHY: PUERTO RICO, MARTIN PENA CANAL, DATED 28 JAN 1983.
 FIELD BOOKS: PUERTO RICO FIELD BOOKS 23, 24, 25, 26 AND 27, DATED 1983.

GRID COORDINATES ARE BASED ON LAMBERT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO 1979 ADJUSTMENT.

STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDENER STATIONING.

ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (-) SIGN.
 SEE SHEET NO. 2 FOR LEGEND.



PREPARED BY:	DEPARTMENT OF THE ARMY
CHIEF, LEVEE & WATERWAYS SECTION	JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
SUBMITTED BY:	JACKSONVILLE, FLORIDA
CHIEF, DESIGN BRANCH	SAN JUAN, PUERTO RICO
APPROVAL RECOMMENDED	AGUA-GUAGUA PROJECT
CHIEF, ENGINEERING DIVISION	DREDGING MARTIN PENA NAVIGATION
APPROVED:	CHANNEL PLAN (PLAN IX)
	LOCATION AND INDEX
CD, C.E.	DISTRICT ENGINEER
OWN BY:	INV. NO.
<i>Dub</i>	
CRD BY:	SIZE
	F
	DATED:
	SCALE: AS SHOWN
	DATED:
	SHEET 1 OF 7



SAFETY ON THIS JOB DEPENDS ON YOU

NO.	DATE	REVISIONS	DATE APPROVED



NOTES:

- HORIZONTAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO USC & GS STATION MORRO LIME CREEK USING SECOND ORDER, CLASS II ACCURACY STANDARDS.
- VERTICAL PROJECT CONTROL WAS ESTABLISHED RELATIVE TO THE NOS. TIDAL BENCHMARK CLUSTER LOCATED AT THE FORMER U.S. NAVY RESERVATION. THE NOS. 895-930, DATED 24 MAR 1910. ALL ELEVATIONS SHOWN ARE REFERRED TO MEAN LOW WATER. THE MEAN ELEVATION OF NOS. 8 IN NO. 13 1905 (1) 0.5 FEET ABOVE MEAN SEA LEVEL WAS HELD FOR ALL SUBSEQUENT VERTICAL CONTROL IN THE PROJECT. MEAN LOW WATER AT SAN JUAN, PUERTO RICO, IS BASED ON 21 MONTHS OF RECORDS, APRIL 1967-DECEMBER 1967 REDUCED TO MEAN WALLS.
- PHOTOMAPPING CONTROL WAS ESTABLISHED DURING THE PERIOD JAN - FEB 1983 BY RILEY, PARK, HAYDEN & ASSOCIATES, ATLANTA, GA. 1 AND SOUTHERN RESOURCE MAPPING CORP. IRMONDO BEACH, FL.
- PLANIMETRIC AND TOPOGRAPHIC MAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 200'.
- HIGH ALTITUDE AIR PHOTOMAPPING PHOTOGRAPHY WAS FLOWN ON 28 JAN 1983, AT A NEGATIVE SCALE OF 1" = 200'.
- PLANIMETRIC AND TOPOGRAPHIC MAPPING WAS PERFORMED UTILIZING STANDARD FIRST-ORDER PHOTOGRAMMETRIC STEREO PLOTTING INSTRUMENTATION BY SOUTHERN RESOURCE MAPPING CORP. DURING FEB - MAR 1983.
- ALL MAPPING WAS DESIGNED TO MEET THE NATIONAL MAP ACCURACY STANDARDS.
- CONTOUR INTERVAL 2 FEET.
- ARCHIVED DATA SOURCES:
PHOTOGRAPHY: PUERTO RICO, MARTIN PENA CANAL, DATED 28 JAN 1983
FIELD BOOKS: PUERTO RICO FIELD BOOKS 01, 24, 25, 26 AND 27, DATED 1983
- GRID COORDINATES ARE BASED ON LAURENT PLANE RECTANGULAR SYSTEM FOR PUERTO RICO 1974 ADJUSTMENT.
- STATIONING REFERS TO CENTERLINE OF CHANNEL EXCEPT FOR WIDENER STATIONING.
- ALL ELEVATIONS ARE ABOVE THE REFERENCE PLANE UNLESS PRECEDED BY A NEGATIVE (+) SIGN.
- SEE SHEET NO. 2 FOR LEGEND.



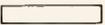
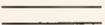
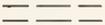
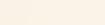
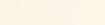
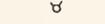
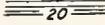
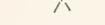
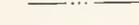
DESIGNED BY	DEPARTMENT OF THE ARMY
DRAWN BY	JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
CHECKED BY	JACKSONVILLE, FLORIDA
DATE	SAN JUAN, PUERTO RICO
PROJECT NO.	AGUA-GUADAJA PROJECT
PROJECT TITLE	DREDGING MARTIN PENA NAVIGATION
PROJECT LOCATION	CHANNEL, PLAN 1 PLAN 102
PROJECT NUMBER	LOCATION AND INDEX
DATE	NO. 00
SCALE: AS SHOWN (DATE)	SHEET 1 OF 7

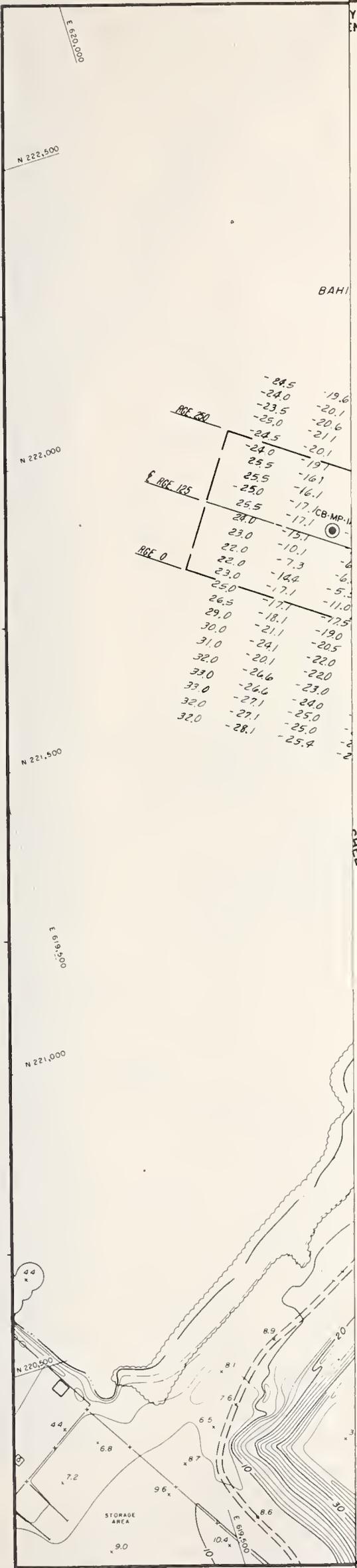
ON THIS JOB
ENDS ON YOU

REVISIONS

NO.	SYM	ZONE	DATE	APPROVED

LEGEND

-  BUILDINGS
-  ROADS
-  DRIVE, PARKING AREA
-  GUARD RAIL
-  FENCE
-  POWER LINE
-  TOWER
-  POLE
-  LIGHT POLE
-  MANHOLE
-  SIGN
-  FIRE HYDRANT
-  VALVE
-  CATCH BASIN
-  CONTOURS
-  DEPRESSION CONTOURS
-  TREE CLUSTER
-  PALM TREE
-  WATER
-  SWAMP
-  HORIZONTAL CONTROL
-  SPOT ELEVATION
-  PROJECT CHANNEL
-  AREA TO BE DREDGED
-  DISPOSAL AREA
-  SOUNDING AND LOCATION
-  CORE BORING LOCATION AND DESIGNATION



SHEET NO. 3



NOTE: SEE SHEET 1 FOR NOTES.
SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA - GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL PLAN IV
PLAN

DESIGN NO.:	INV. NO.	DATE	SCALE: AS SHOWN
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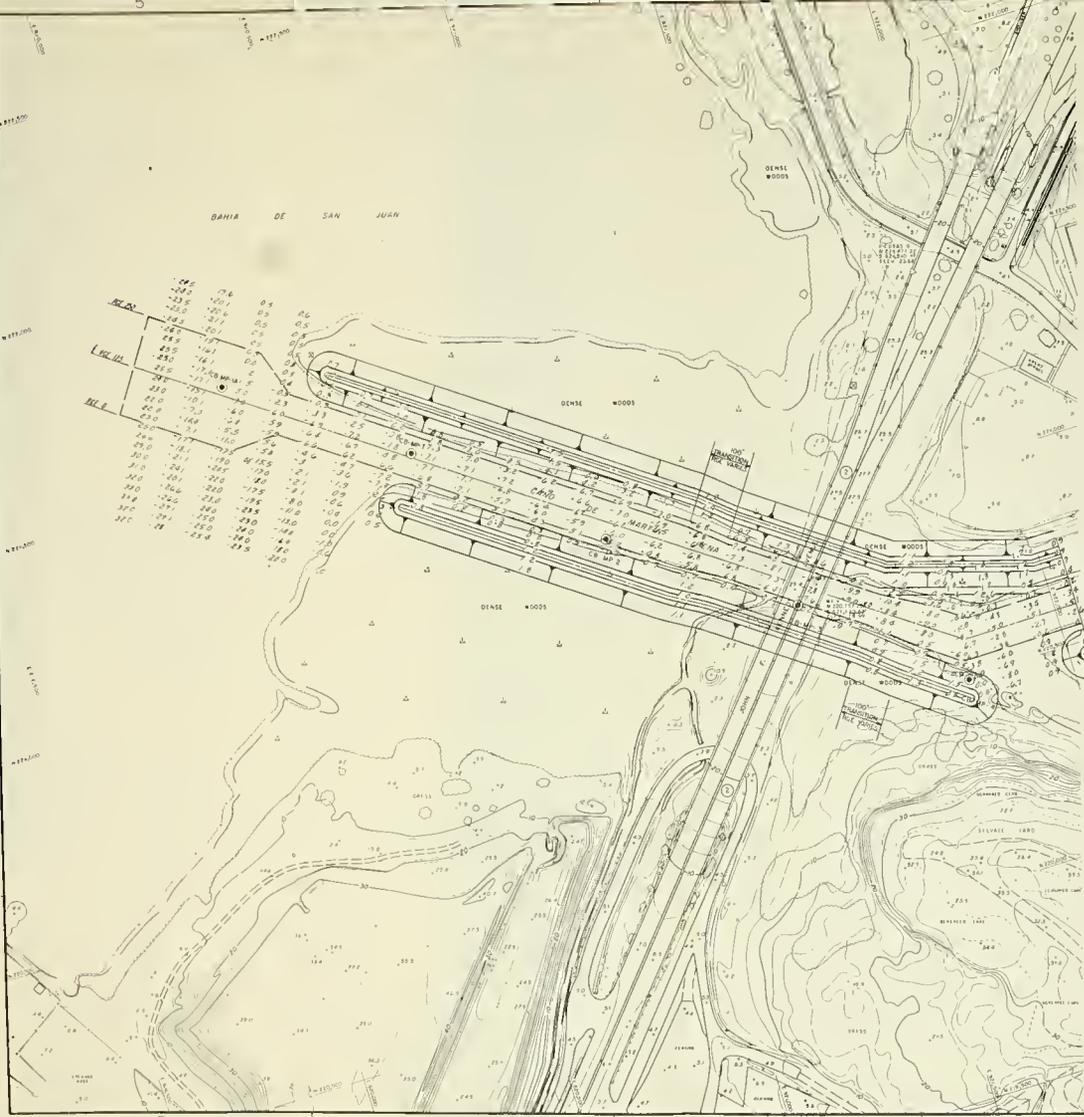
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SHEET 2 OF

SAFETY ON THIS JOB
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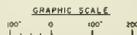
NO.	DATE	REVISIONS	DATE APPROVED

- LEGEND**
- BUILDINGS
 - ROADS
 - DRIVE, PARKING AREA
 - GUARD RAIL
 - FENCE
 - POWER LINE
 - TOWER
 - POLE
 - LIGHT POLE
 - MANHOLE
 - SIGN
 - FIRE HYDRANT
 - VALVE
 - CATCH BASIN
 - CONTOURS
 - DEPRESSION CONTOURS
 - TREE CLUSTER
 - PALM TREE
 - WATER
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 - HORIZONTAL CONTROL
 - SPOT ELEVATION
 - PROJECT CHANNEL
 - AREA TO BE DREDGED
 - DISPOSAL AREA
 - SOLIDING AND LOCATION
 - CORE BORING LOCATION AND DESIGNATION

THIS SHEET IS A
 PART OF THE
 PROJECT SHEET NO. 3



NOTE - SEE SHEET 1 FOR NOTES.
SEE PLAN 1 FOR CORE BORING LOGS

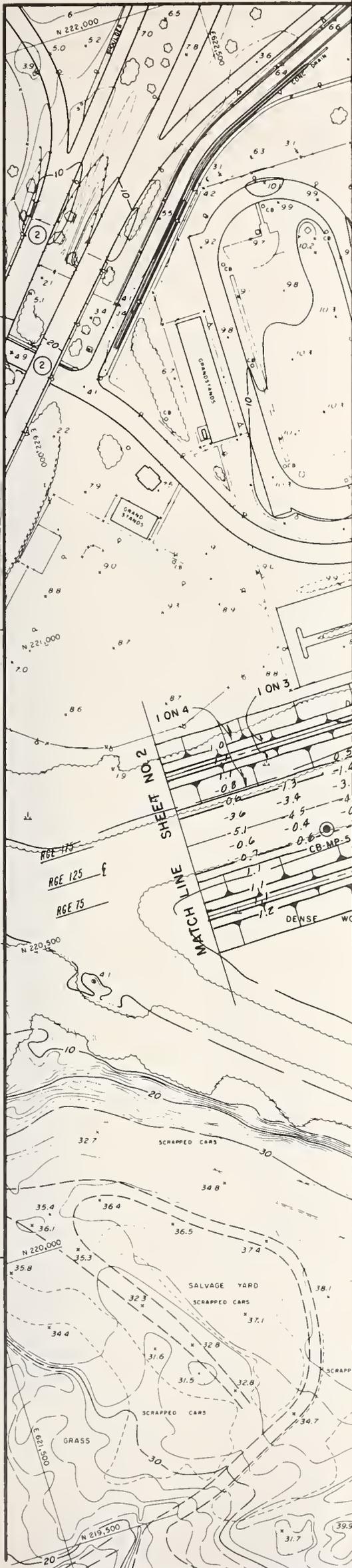


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

**AQUA - GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION**

CHANNEL - PLAN 1021
PLAN

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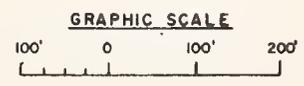


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ENDS ON YOU

REVISIONS			DATE	APPROVED
NO.	SYM	ZONE		



NOTE: SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND.
SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AQUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION

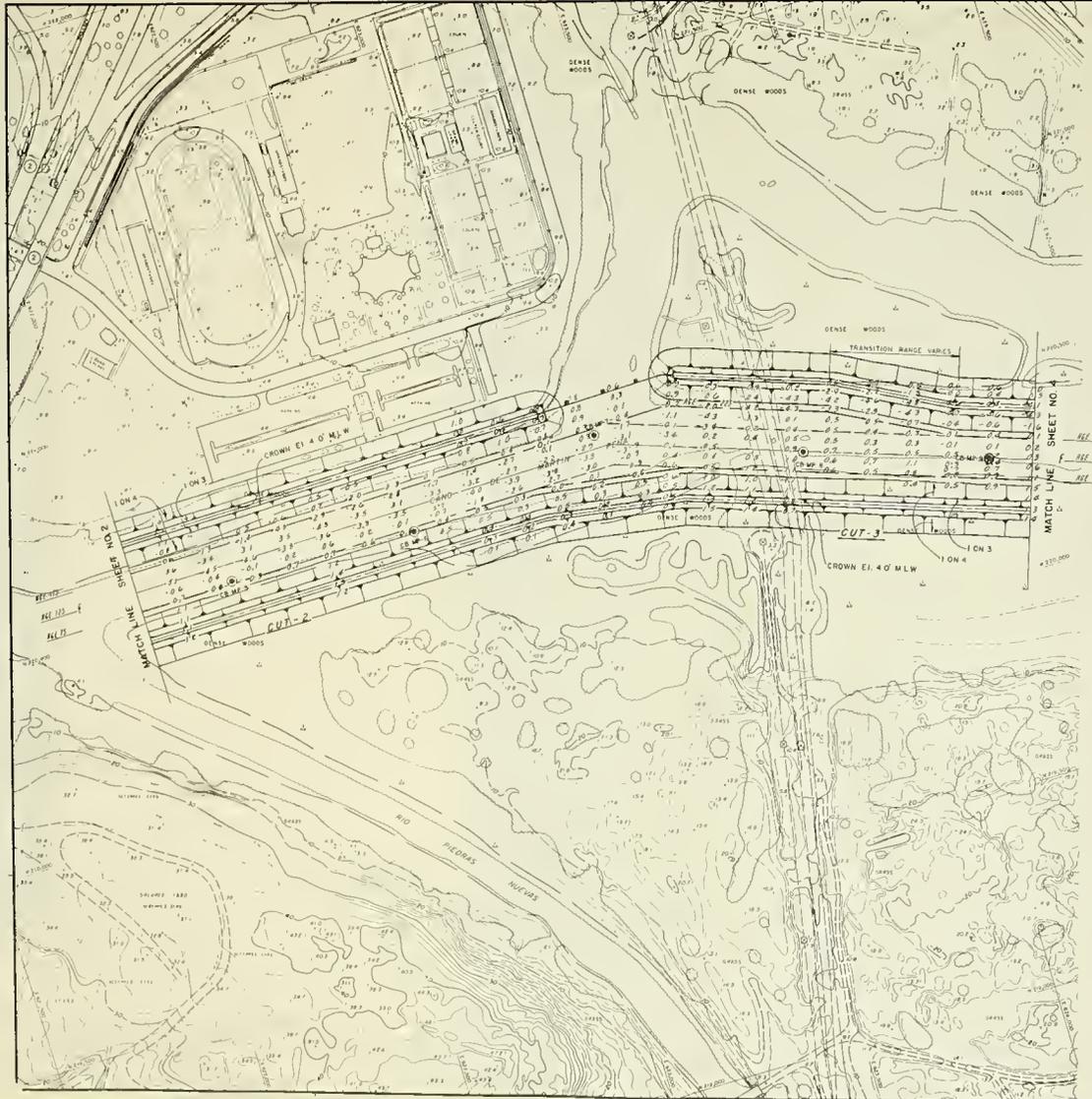
CHANNEL (PLAN IV)
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SAFETY ON THIS JOB
DEPENDS ON YOU

REVISIONS

NO.	DATE	REVISIONS	DATE APPROVED



NOTE: SEE SHEETS 1 AND 2 FOR NOTES AND LEGEND
SEE PLAN I FOR COPE BEATING LOSS



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO
AGUA-CUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION

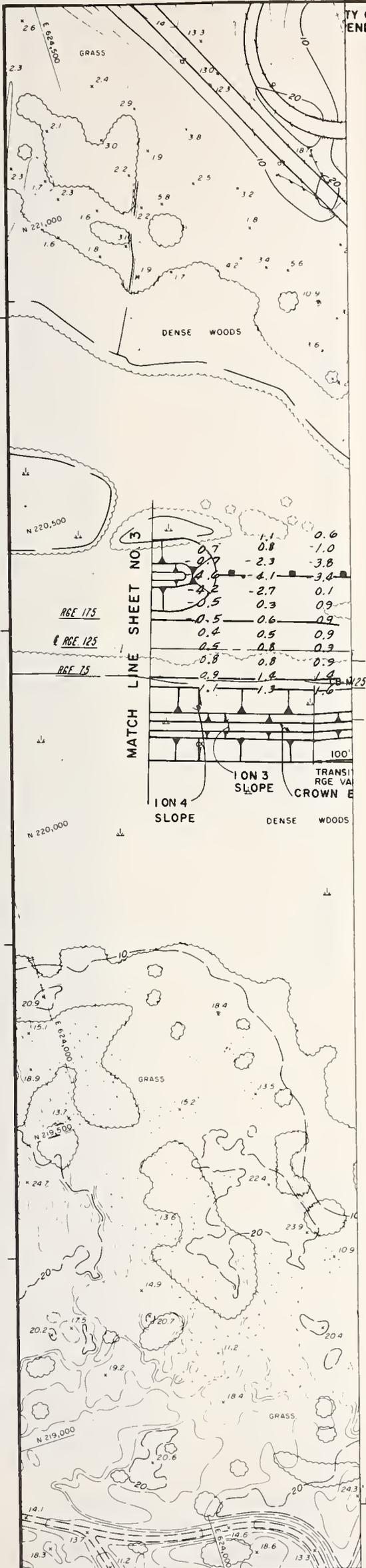
CHANNEL 1 PLAN 22
PLAN

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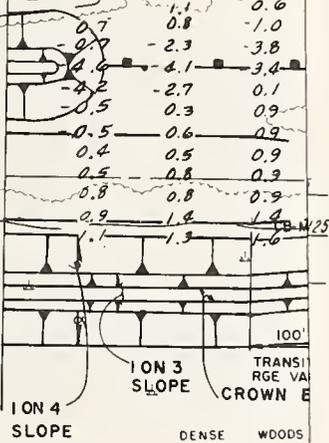
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MATCH LINE SHEET NO. 3

RGE 175
RGE 125
RGE 75



NOTE:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
SEE PLAN I FOR CORE BORING LOGS.



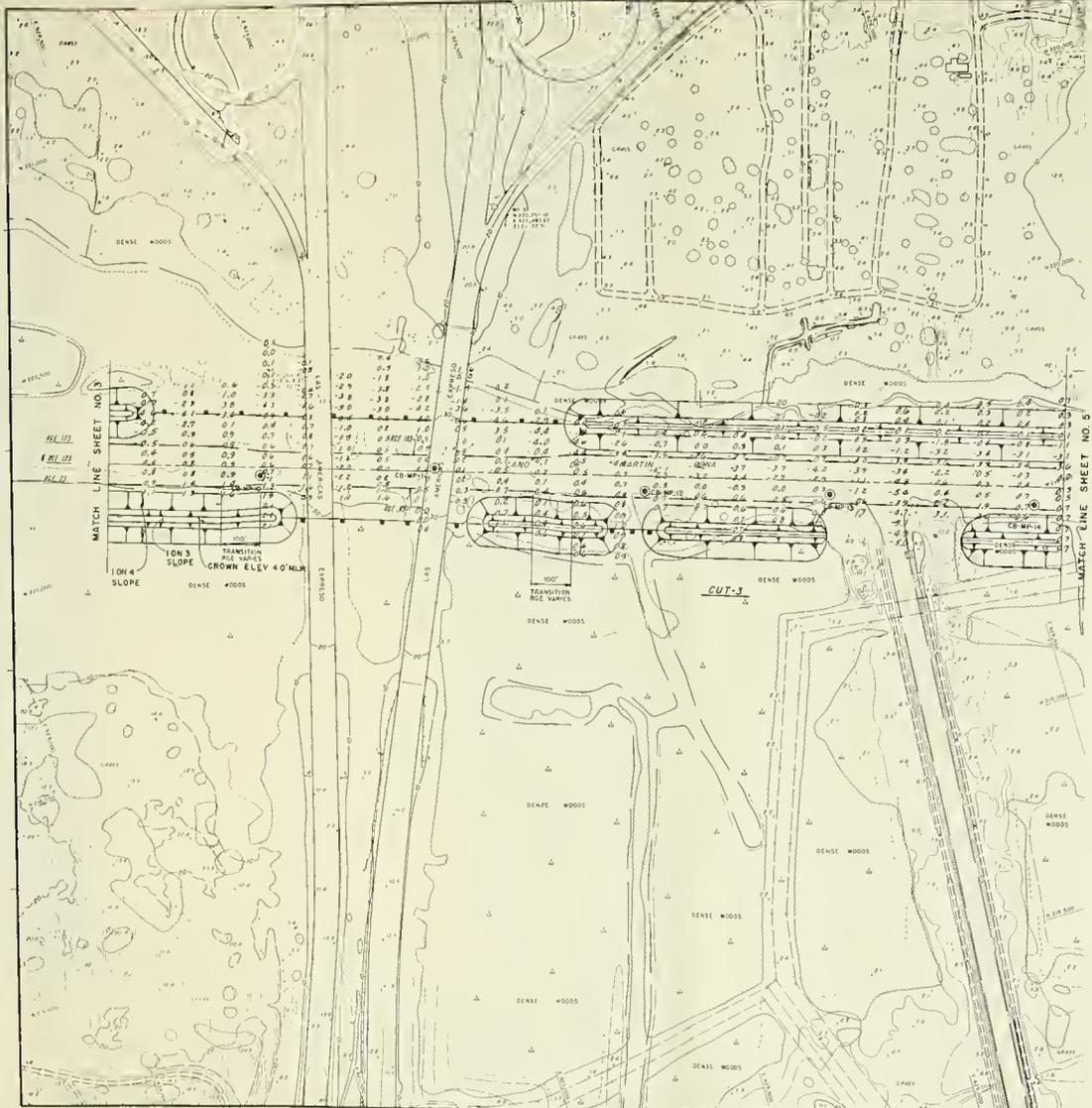
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENNA NAVIGATION
CHANNEL (PLAN IV)
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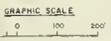
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NO.	DESCRIPTION		



SEE 112
SEE 113
SEE 114

MATCH LINE SHEET NO. 5

MATCH LINE SHEET NO. 4

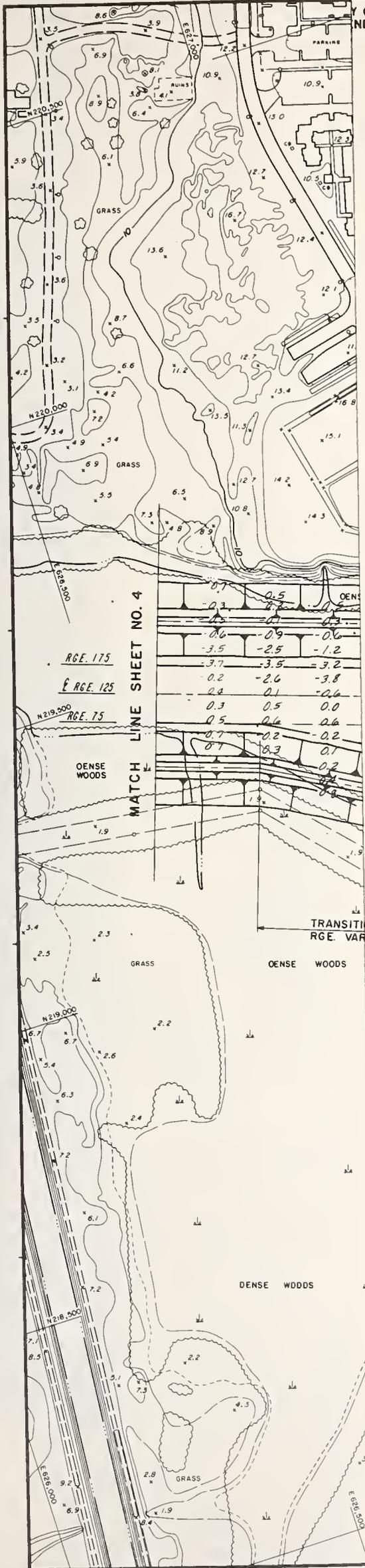


NOTE:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND
SEE PLAN I FOR CORE BORING LOGS

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUACUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN EX-1)

SCALE: AS SHOWN DATED: SHEET 4



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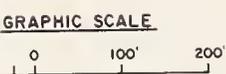
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NO.	SYMBOL	ZONE		

MATCH LINE SHEET NO. 4

RGE. 175	0.7	0.5	0.2
RGE. 125	-0.3	-0.9	-0.6
RGE. 75	-3.5	-2.5	-1.2
	-3.7	-3.5	-3.2
	-0.2	-2.6	-3.8
	0.4	0.1	-0.6
	0.3	0.5	0.0
	0.5	0.6	0.6
	0.7	0.2	-0.2
	0.7	0.3	0.1
	1.9	1.9	1.9



NOTE:
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND.
SEE PLAN I FOR CORE BORING LOGS.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

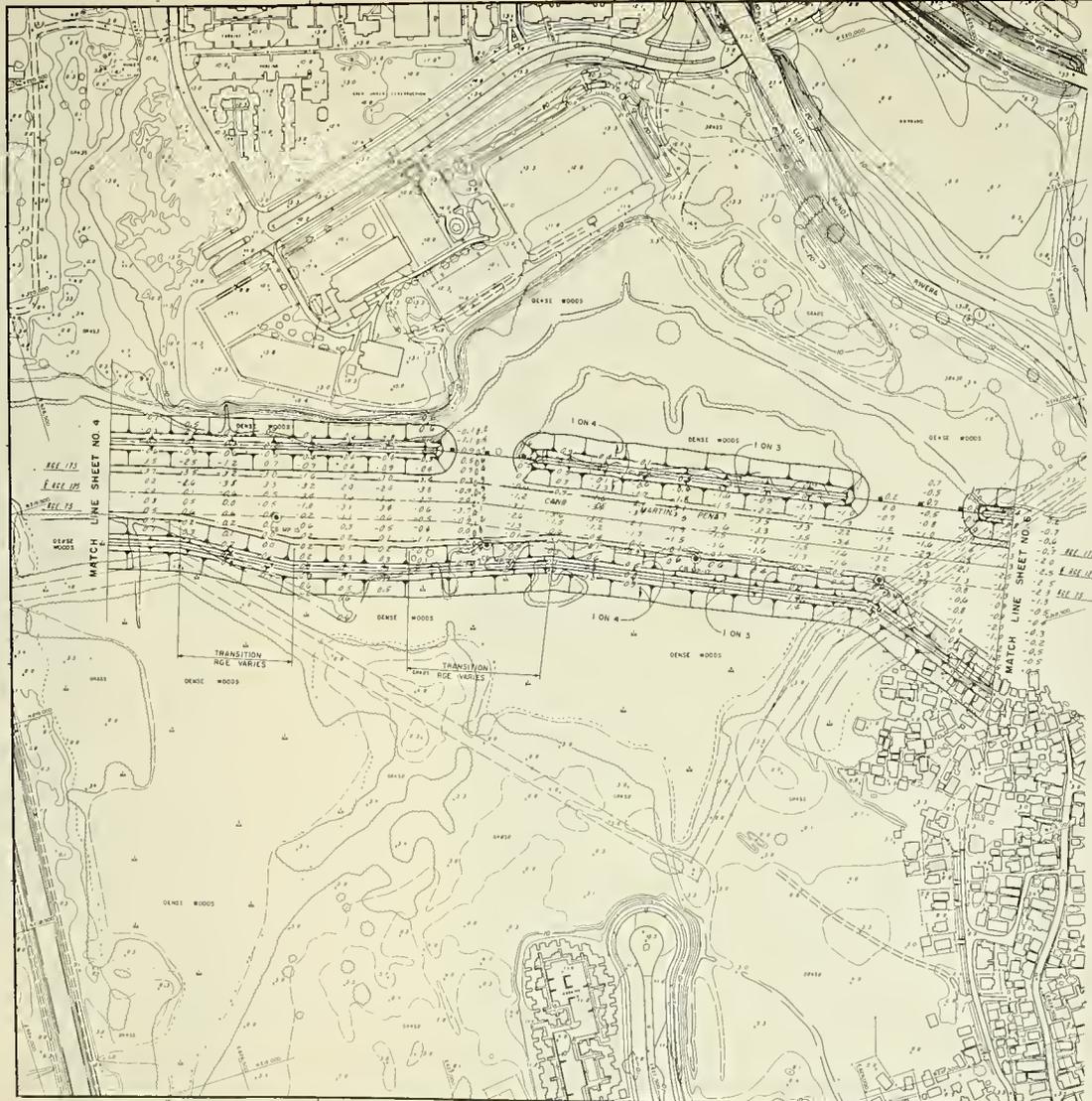
AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION

CHANNEL (PLAN IV)
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SEE 175
SEE 176
SEE 177

MATCH LINE SHEET NO. 4

MATCH LINE SHEET NO. 6

TRANSITION
RICE VARIES

TRANSITION
DENSE RICE WOODS

SEE 178
SEE 179
SEE 180



NOTE
SEE SHEETS 1 & 2 FOR NOTES AND LEGEND
SEE PLAN 3 FOR CORE BORING LOGS

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO
**AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION**
CHANNEL 1 PLAN 22: 1

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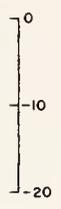
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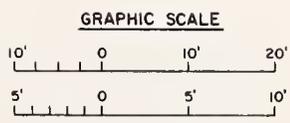
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NOTE - SEE PLAN III FOR BULKHEAD SECTION



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-GUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN IX)

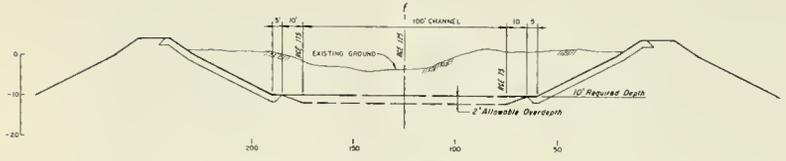
SECTIONS

DESIGN BY	G. A. M.	SIZE	F	DRAW. NO.
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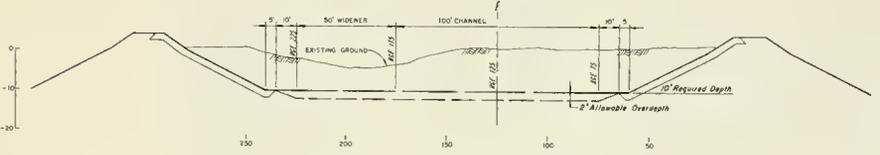
ELEVATION IN FEET

SAFETY ON THIS JOB
DEPENDS ON YOU

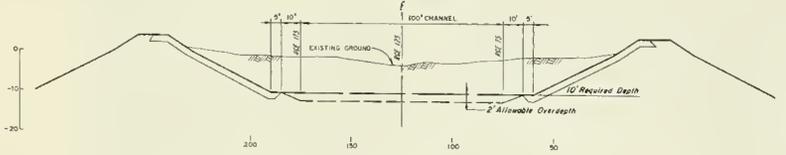
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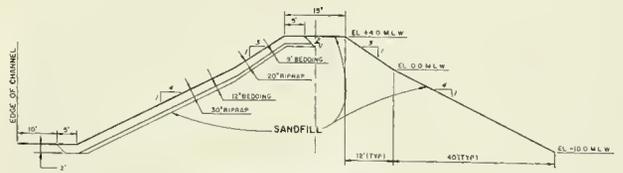
CUT-2
CHANNEL AND DIKE SECTION



CUT-3
CHANNEL AND DIKE SECTION

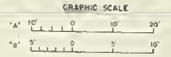


CUT-4
CHANNEL AND DIKE SECTION



TYPICAL REVETMENT SECTION
SCALE: HORIZ. 1" = 20'
VERT. 1" = 5'

NOTE - SEE PLAN III FOR BULKHEAD SECTION



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
SAN JUAN, PUERTO RICO

AGUA-SUAGUA PROJECT
DREDGING MARTIN PENA NAVIGATION
CHANNEL (PLAN III)

SECTIONS

SCALE AS SHOWN

DATE: 7/1

SHEET 7

APPENDIX D

LETTERS OF COMMENTS



United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW

Southeast Region / Suite 1384
Richard B. Russell Federal Building
75 Spring Street, S.W. / Atlanta, Ga. 30303

JUN 28 1983

ER-83/657

Mr. Charles H. Graves, Director
Office of Planning Assistance
Urban Mass Transportation
Administration
400 7th Street, SW
Washington, D.C. 20590

Dear Mr. Graves:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) for San Juan Urban Core Transportation System (Aqua-Guagua), San Juan, Puerto Rico, and has the following comments.

General Comments

The comments of the Fish and Wildlife Service relate to the waterway component of the plan as the other three components would not have significant effects on fish and wildlife resources. An excellent inventory of the fish and wildlife resources is presented in the DEIS.

The six alternatives presented vary greatly in the amount of mangroves that would be destroyed by the channel. The mitigation measures are not presented in adequate detail. Each alternative should be assigned a specific mitigation proposal, involving the creation of mudflats and a mangrove revegetation plan. We consider the mangrove loss of a magnitude to warrant a mangrove revegetation program. With proper site preparation, natural revegetation can be as effective as mangrove plantings. There are at least two sites that could be used; the Barriada Tokio residential area, and at the mouth of Tres Monjitas Channel.

The effects of dikes or bulkheads on sheet flow water circulation in the mangroves have not been addressed. The structures could cause ponding and cutoff mangroves from tidal flow, thereby reducing long term survival of mangroves. The two tracts of mangroves extending into San Juan Bay downstream of the Constitution Bridge are the most

important roosting sites for the endangered yellow-shouldered blackbird (Agelaius xanthomus) and brown pelican (Pelecanus occidentalis). An alternative to reduce impact would be a channel with a 100-foot wide bulkhead, downstream of Constitution Bridge, while providing two-way ferry traffic in a 180-foot wide channel upstream of the bridge.

Specific Comments

Page 15 - Dike System. Provisions for tidal flow in and out of the mangroves and sheet flow from runoff can be improved by alternating the elevation of the panels between the pilings.

Pages 75-76 - Impacts. Alternative 2 would produce positive benefits through tidal flushing. The other plans would result in net losses, with diking causing the most severe effects.

Page 76 - Mitigation Measures. We do not agree that Alternatives 2 and 5 would cause minimal mangrove losses. Sites for mangrove mitigation should be designated in the revised DEIS. Mudflat sites (Figure 12) need more study for suitability to accomplish mitigation.

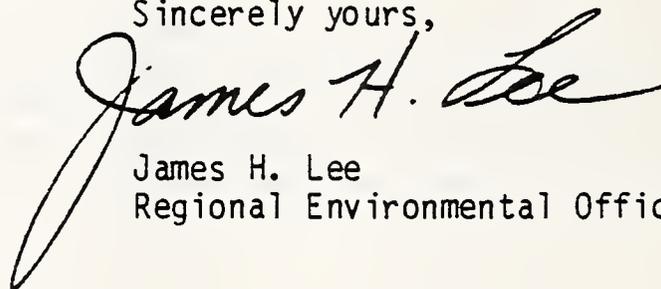
Page 79 - Endangered Species. The statement about mudflats is in conflict with information on page 34. Feeding and roosting areas are essential habitat components for the endangered species. Table 20 information does not support the contention that mudflats alone would be adequate mitigation.

Summary

Alternative 2 is the least damaging Alternative. Alternative 5 damages can be environmentally acceptable with adequate mitigation. A combination of Alternatives 2 and 5 would also be acceptable with adequate mitigation. If the selected plan does not provide for mitigation of the unavoidable losses to fish and wildlife resources, we would recommend the denial of a Section 404 permit for construction of the project.

We appreciate the opportunity to comment on the document.

Sincerely yours,



James H. Lee
Regional Environmental Officer



Caribbean Area Office, Region II
Federico Degetau Federal Building,
U.S. Courthouse, Room 428
Carlos E. Chardon Avenue
Hato Rey, Puerto Rico 00918

June 28, 1983

Mr. Charles H. Graves, Director
Office of Planning Assistance
US DOT/UMTA
400 - 7th St., S.W.
Washington, D.C. 20590

Dear Mr. Graves:

SUBJECT: Draft EIS
San Juan Urban Core Transportation System
(AGUA-GUAGUA)

Our review of the subject Draft EIS reveals that five (5) HUD aided housing developments may be affected by the proposed transportation system. San Juan Park housing development may be affected by dredging operations along the Martin Peña Channel and La Morada, Jardines de Cuenca, San Juan Tower and Egida Colegio de Abogados housing developments may be affected by increases in noise levels.

We will appreciate your assistance in reducing to a minimum impacts to said housing developments.

In addition to the above, we recommend that the EIS be improved by including within the text a summary of the relocation plan for Barriada Tokio. The elimination of said slum area is the most important social and economic impact of the project and as such it should be highlighted in the EIS. This factor will be heavily weighted if the project is subject to a cost-benefit analysis.

Thank you for giving us an opportunity to comment on this EIS.

Sincerely,

A handwritten signature in cursive script, reading "Felipe Gorbea Fernández", is written over a large, stylized flourish that extends to the right.

Felipe Gorbea Fernández
Deputy Area Manager, 2.2SD



**U.S. Department of
Transportation**

Office of the Secretary
of Transportation

Regional Representative
of the Secretary

Region III
434 Walnut Street
Philadelphia, PA. 19106

30 June 1983

Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 Seventh Street, S.W.
Washington, DC 20590

Dear Mr. Graves:

I am providing comment on the Draft Environmental Impact Statement for the San Juan Urban Core Transportation System. I have provided copies to all modal administrations responsible for activities in Puerto Rico and have received comments from only the Maritime Administration.

MARAD has, at the Merchant Marine Academy, Kings Point, New York, their Computer Assisted Operations Research Facility (CAORF) which might provide a means to reduce construction costs and review times, mitigate or reduce the dredging requirements, and reduce the risks in navigational requirements for this project. I am enclosing documents from MARAD which illustrate the capabilities of CAORF, showing how it can be used in this project. It is believed that CAORF could be used in this specific case to test a series of channel designs to produce alternatives which:

- a. reduce the amounts of material to be dredged
- b. reduce the amounts of materials to be disposed of at sea
- c. reduce the risks of collisions along the channel.

Additionally, items 1, 2, and 5 listed under paragraph D (Mitigation Measures) can be evaluated from a ship handling and maneuvering standpoint with the latest ships simulation technology.

I suggest that you contact MARAD, specifically Carl J. Sobremisana of the Office of Ports and Intermodal Development at (202) 426-4357.

I hope that these comments and CAORF will be useful in the final project.

Sincerely,

George D. Bond, II
Lieutenant Commander
U.S. Coast Guard
Senior Staff Officer



United States
Department of
Agriculture

Soil
Conservation
Service

Caribbean Area
GPO Box 4868
San Juan, PR 00936

June 8, 1983

03 JUN 14 AM 9:06

Mr. Rafael Faría
Secretary, DTPW
Box 41269 Minillas Sta.
Santurce, PR 00940

SECRETARÍA DE
AGRICULTURA
SECRETARIO

Re: Draft EIS
Agua-Guagua Project

Dear Mr. Faría:

We have reviewed the draft EIS for the above referenced project. Our comments are as follows:

Erosion will be generated by vessel wakes along the navigational channel sideslopes and runoff water entering the channel. This will cause channels to be affected by sediment and debris. In order to keep channel in good navigable condition, maintenance dredging or any other type of cleaning process needs to be implemented. This process will generate a considerable amount of material for disposal. We suggest that this dredge material be analyzed and disposed of in a safe and adequate site in order to protect the environment. The site should be selected by persons with expertise in this discipline. If the material is piled up in a nearby area, without proper protection, it will return to the channel when erosion and runoff occur. Construction of the proposed project will require excavation in some areas. The material obtained from this phase should be disposed of into safe sites in order not to cause damage to nearby areas and the environment. Disturbed areas should be properly stabilized with adequate materials in order to prevent or minimize erosion. In areas where plant materials are used, same should be well adapted to the various site conditions.

We further suggest that our comments be considered to prepare a sediment and erosion control plan for the proposed project. This plan should be part of the final environmental impact statement and included in the final design specifications for the project. The plan must be implemented in order to be effective for its intended purpose.

If we can be of any further assistance, please do not hesitate to call on us again.

Sincerely,

Iván R. Emmanuelli
Director

pc: Environmental Quality Board, Santurce, PR
District Conservationist, Río Piedras FO





United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services and
Endangered Species Field Office
P.O. Box 3005 - Marina Station
Mayaguez, Puerto Rico 00709-3005

June 27, 1983

Mr. Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Mr. Graves:

Re: Agua-Guagua Project, Endangered Species Consultation Log No. 4-4-83-007

We have reviewed the Draft Environmental Impact Statement (DEIS) for the San Juan Urban Core Transportation System (Agua-Guagua).

Page 79 of the DEIS states that the proposed project will have no effect on the brown pelican (Pelecanus occidentalis) or the yellow-shouldered blackbird (Agelaius xanthomus) if mudflats are created to compensate for the loss by dredging of that habitat type. However, on Page 34, mangroves are considered to be important as loafing and roosting areas for the pelican. Yellow-shouldered blackbirds also roost and feed in the mangroves. How was it determined that the project would not affect endangered species when loss of mangrove habitat of from 1.73 to 40.21 acres would result, depending on the selected alternative?

The environmental effects matrix on Page 77 (Table 20) indicates that channel dredging and straightening, channel revetment, and canal traffic will all have an impact on endangered species. This is not consistent with the statement on Page 79 that there will be no effect on endangered species.

The DEIS states only that the yellow-shouldered blackbird has been observed in the area. We believe that additional information is needed in order to assess the potential impact of the project on this species. It should be determined by a brief survey whether the blackbirds nest in the area, and if so, where. This should include an assessment of whether increased nesting in adjacent wooded areas can compensate for the loss of mangrove

to be incurred by channel construction. Raffaele (1983) wrote of this species, "The principal habitats in which it is encountered are open mangrove areas and arid scrublands." and "A variety of sites are used for nesting including various portions of the mangrove, particularly fairly open flats with scattered small trees, also the axils of palms, hollow stumps, thorny scrubland trees..." The royal palms in the nearby Parque Central are, in addition to the mangroves, suspected nesting sites for the blackbird (Oscar Díaz Marrero, personal communication).

The requested additional information, combined with the selection of a construction alternative, will provide a more adequate estimation of potential impacts. The alternative which minimizes destruction of existing mangroves, particularly below the Constitution Bridge, will be the least detrimental to endangered species. Any negative impacts could be compensated by the creation of a mangrove wetland and/or the planting of royal palms in nearby uplands.

These comments are intended to assist the Commonwealth's Department of Transportation and Public Works and the Urban Mass Transportation Administration in meeting its responsibilities under Section 7 of the Endangered Species Act. We are available to meet with your staff if you have any questions or comments regarding this consultation. This office requests the opportunity to review and concur with the implementation of the reasonable and prudent alternatives prior to any construction activity.

We appreciate your efforts in helping to establish a healthy, productive environmental setting for your project.

Sincerely,

Agustín P. Valido
Agustín P. Valido
Field Supervisor

Reference

Raffaele, Herbert A. 1983. A Guide to the Birds of Puerto Rico and the Virgin Islands. Fondo Educativo Interamericano Incorporado.

cc: Mr. Rolando García Pacheco
Planning Director
Dept. Transportation & Public Works

Hon. Hilda Díaz Soltero, Secretary
Department of Natural Resources

AHP, FWS, Atlanta
AFA, FWS, Atlanta

Nistor Quevedo



U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
Federico Degetau Federal Building
and U. S. Courthouse
Room 150, Carlos Chardon Street
Hato Rey, Puerto Rico 00918-2288

FWA-226
IN REPLY REFER TO:
HEC-PR

June 30, 1983

Dr. Rafael Faria Gonzalez, Secretary
Department of Transportation
and Public Works
Box 41269
Minillas Station
Santurce, Puerto Rico 00940

Attention: Dr. Rolando Garcia Pacheco, Director
Planning, Programming & Control Office

Dear Dr. Faria:

Subject: Draft EIS, Agua-Guagua Project - Comments

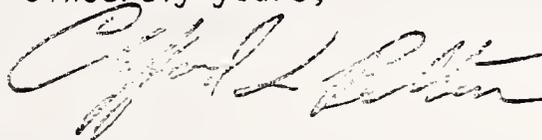
The following comments are submitted in response to your letter of request dated May 13, 1983:

1. It appears that one of the basic elements in the operation of the proposed Agua-Guagua project is an adequate, efficient and expeditious busway to get passengers in and out of the terminal. This purpose could be impaired by the existing congestion of traffic in the local street system, in particular Chardon Street, which is proposed as the busway under some of the alternates (Alternates 2 and 3). The Chardon Street, is, and will continue to be, one of the primary connecting links between Plaza Las Americas, the Las Americas Freeway, the Hato Rey business district and the Muñoz Rivera and Ponce de Leon Avenues. The current and future construction of the New San Juan Center will add to the influx of traffic and increase traffic congestion in the area. An exclusive roadway other than Chardon Street for the busway would be most desirable in moving passengers to and from the terminal and would assist in securing efficient operation of this link in the proposed system.
2. The feasibility of removing the concrete sideslopes under the Calaf Street Bridge constructed as part of Las Americas Freeway to leave space for the proposed section of separate roadways for the busway should be investigated before a final commitment is made. It seems from the description of Alternate 1 on page 17

that it is also intended to have mixed traffic along Calaf Street. This condition does not come clear from the layout of the bus alternates in Appendix B.

3. It would be desirable to have the completed freeway system in the vicinity of the proposed project in all maps and figures. Only part of the completed system is shown. In this manner there is a better perspective of the project impact areas with respect to the completed transportation system.
4. A parking alternate close to the proposed Hato Rey terminal is desirable for those periods during the year that the parking at Plaza Las Americas and other immediate areas are at capacity.

Sincerely yours,



For: Juan O. Cruz
Division Administrator

cc: Secretary DTPW
Ana Piñero
Nestor Quevedo



15 de julio de 1983

Hon. Rafael Faría
Secretario
Departamento de Transportación
y Obras Públicas
Apartado 41269 - Estación Minillas
Santurce, Puerto Rico 00940

Atención: Sr. Rolando García Pacheco
Director de Planificación

Asunto: Proyecto Agua-Guagua
San Juan

Estimado señor Secretario:

La Junta de Calidad Ambiental ha revisado la Declaración de Impacto Ambiental Preliminar (DIA-P) para el proyecto de referencia. A continuación nuestros comentarios, los cuales sustentan nuestra posición:

1. La alternativa a ser seleccionada podría eliminar alrededor de cuarenta (40) acres de manglar.
2. Entendemos que la eliminación de este manglar reducirá el alimento, reposo y albergue a muchas especies de aves, inclusive a dos de ellas, protegidas por leyes federales, las cuales están en peligro de extinción. Además, en un documento publicado por el Departamento de Recursos Naturales (DRN), titulado "Rare and Endangered Animals of Puerto Rico, A Committee Report, 1973", se indica que se encuentran en el área la gaviota pico agudo Thalasseus maximus (residente permanente raro en Puerto Rico), el playero pico corvo Numenius phaeopus, el playero alihlanco Catoptrophorus semipalmatus y el chorlo pico corto Limnodromus griseus (migratorias raras en Puerto Rico).
3. La captura experimental de peces realizada en diciembre de 1982 aparenta haber sido realizada durante un solo día. Entendemos que la misma podría no ser representativa.

Re: Proyecto Agua-Guagua

4. Con relación a los residentes de la Barriada Tokio, no se discute cual es el impacto socioeconómico del desplazamiento del lugar donde ahora viven.
5. La DIA-P en cuestión no discute otras alternativas viables para solucionar el problema de transportación. La misma se limita a discutir variaciones del proyecto propuesto.
6. En el documento sometido no se presenta en forma clara y concisa el posible impacto ambiental sobre las aguas de Puerto Rico. No especifica si habrá servicios sanitarios, desperdicios químicos, tanques de almacenamiento de combustible o cualquier otra sustancia química, así como todo lo relacionado con la calidad de las aguas y las alternativas y medidas a implementarse para proteger las mismas.
7. En la página 56 se indica que la construcción del canal mejorará las condiciones del agua y ayudará a reducir su degradación. También se señala que la ecología del área se beneficiará con la reducción de la sobrecarga de nutrientes y la sedimentación excesiva. Consideramos que estas aseveraciones deben fundamentarse científicamente.
 - a) Se entiende que lo único que verdaderamente eliminará la degradación del agua de este canal será la eliminación de las fuentes de contaminación que lo son principalmente los sectores residenciales carentes de alcantarillado sanitario localizados en las márgenes de este canal.
 - b) En cuanto a que la ecología del área va a beneficiarse con la reducción de la sobrecarga de nutrientes y la sedimentación excesiva, la misma declaración menciona el hecho de que el ecosistema del manglar ayuda a prevenir la sedimentación y a remover los nutrientes excesivos y el proyecto propuesto piensa eliminar de 1.73 hasta 40.21 acres, según la alternativa a escogerse de vía acuática.
8. En la página 77, tabla 20, debió indicarse que las cadenas alimenticias son afectadas por las otras dos actividades, pues si los otros parámetros son alterados, eventualmente las cadenas dependen de estos estarán siendo afectados también.

Los comentarios aquí enumerados se limitan a la Declaración de Impacto Ambiental Preliminar y no incluyen la evaluación del informe técnico "Agua-Guagua Project Benthic Sludge/Soil Analyses".

Hon. Rafael Faría

-3-

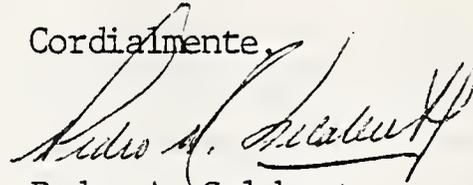
15 de julio de 1983

Re: Proyecto Agua-Guagua

Recomendamos que el Departamento de Transportación y Obras Públicas considere la alternativa de reducir el ancho del canal a los fines de disminuir, tanto la cantidad del dragado como la destrucción de áreas ecológicamente sensitivas.

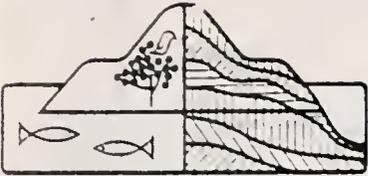
Esperamos que nuestros comentarios le sean de utilidad en la decisión final que se tome sobre el mencionado proyecto.

Cordialmente,



Pedro A. Gelabert
Presidente

62.0019



**DEPARTAMENTO
DE RECURSOS
NATURALES**

12 de julio de 1983

Hon. Rafael Faría
Secretario
Depto. de Transportación
y Obras Públicas
Centro Gubernamental Minillas
Santurce, P.R.

Asunto: Proyecto Agua-Guagua
San Juan, P.R.

DIA 583-005 TOP (Preliminar)

Estimado señor Faría:

Hago referencia a su reciente comunicación donde solicita nuestras recomendaciones en relación al proyecto de epígrafe.

Por este medio queremos informarle que el Departamento de Recursos Naturales recomienda favorable el proyecto según propuesto en la Declaración de Impacto Ambiental.

Consideramos que la información que se expone en este documento es adecuada, ya que se incluyen los posibles impactos adversos al medio ambiente y a la vida silvestre de la zona. Además, incluye planes de mitigación para minimizar estos posibles daños.

No obstante, deseamos señalar que los manglares localizados en los terrenos anegados adyacentes al Puente de la Constitución, no deben afectarse por las obras a realizarse, ya que son una de las pocas áreas en San Juan que sostiene una abundante vida acuática. Esta área resulta ser uno de los pocos espacios verdes y de valor ecológico que se ha visto en constante peligro de desaparecer. Recomendamos se mantenga en su estado natural el área antes mencionada.

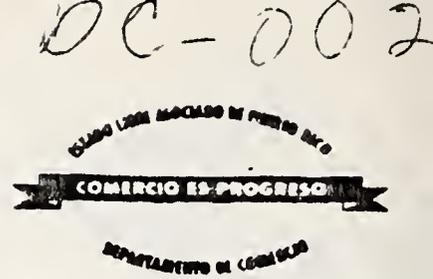
Cordialmente,

Gabriel del Toro
Gabriel del Toro
Secretario Auxiliar
Planificación de Recursos

SECRETARÍA
15 JUL 9 57

Departamento de Comercio

APARTADO S 4275. SAN JUAN. PUERTO RICO 00905



C-0439

13 de julio de 1983

Hon. Rafael Faría
Secretario
Departamento de Transportación
y Obras Públicas
Apartado 41269
Estación Minillas
Santurce, P.R. 00940

RE: DIA Preliminar
Agua - Guagua

Estimado señor Faría:

Me refiero a la solicitud de comentarios a la Declaración de Impacto Ambiental del Proyecto Agua-Guagua. Por cuanto hay un número de estructuras de uso comercial que serán afectadas hemos procedido a evaluar el impacto que cada una de las alternativas de ruta de guaguas pueda tener sobre ese sector.

De acuerdo a los datos suministrados se están evaluando cuatro (4) alternativas para las guaguas que transportarán las personas desde el terminal de las lanchas en Hato Rey, hasta el Parque Hiram Bithorn, lugar donde se podrían estacionar los vehículos privados de las personas que vayan a utilizar el sistema.

En la primera alternativa se afectará la siguiente estructura:

- a. Condado Windows, Inc.- parte de la estructura dedicada a taller de productos de vidrio.

En la segunda alternativa se afectarán las siguientes estructuras

- a. Condado Windows, Inc. - taller de productos de vidrio.

- b. Edificio de hormigón de tres niveles con el siguiente uso:
 - Piso 1 - Negocio de venta de piezas de televisión
 - Piso 2 - Desocupado
 - Piso 3 - Sociedad para Sordos
- c. Edificio de hormigón de tres niveles con el siguiente uso:
 - Piso 1 - Michael Lith Puerto Rico, Inc.
 - Piso 2 - Escuela de Baile
 - Piso 3 - Desocupado
- d. Edificio de Hormigón de cuatro niveles (Edificio IBS)

En la tercera alternativa se afectarán:

- a. Condado Windows, Inc.
- b. Cobertizo de aluminio solar de autos
- c. Cobertizo de aluminio solar de autos Chaves Ramírez, Inc.
- d. Ranchones de la Compañía Tres Monjitas.

En la cuarta alternativa se afectará:

- a. Condado Windows, Inc.

Después de haberse realizado una inspección del área encontramos que:

- a. Condado Windows, Inc. se quemó
- b. Michael Lith Puerto Rico, Inc., cerró
- c. Venta de piezas de televisión está cerrado
- d. Kiosko Calle Chardón está cerrado

Dada esta situación las alternativas 1, 3 y 4 tendrían nuestro endoso favorable.

Debo señalar que aunque en dos de los edificios afectados, en la segunda alternativa, funcionan dos entidades de servicios éstos no van dirigidos a los residentes del área inmediata, sino que su clientela proviene de otras áreas. Entiendo que el servicio podría continuar en cualquier otra ubicación.

Por otro lado, en la tercera alternativa se afecta un cobertizo de un solar de autos cuya actividad continuaría en el lugar. La misma situación ocurriría con la Compañía Tres Monjitas.

Pese a que estas tres alternativas no alteran los servicios a la comunidad ni afectan las actividades comerciales, consideramos que se debería evaluar la posibilidad de desarrollar un área de estacionamiento en terrenos adyacentes al terminal donde el usuario pudiera encontrar una mayor seguridad para su auto. En otras ocasiones se ha experimentado sin éxito con proveer estacionamiento en ciertas áreas y de ahí transportarse en guagua hacia el área de San Juan. Una de estas pruebas conllevó la construcción de un área de estacionamiento en la Parada 26, área cercana al terminal propuesto.

Por otro lado, y como se señalara en la vista pública el área del complejo deportivo que se planifica utilizar, está siendo usada parcialmente por el Cuartel General de la Policía. Además, tanto el Hiram Bithorn como los Coliseos llevan a cabo actividades diurnas lo que afectaría el uso del estacionamiento.

Opinamos que se debería evaluar la posibilidad de proveer el estacionamiento en el antiguo terminal de la Autoridad Metropolitana de Autobuses ahí en Hato Rey. Esto no impediría el que se re-establezca el sistema de Mini-Buses desde el centro de Hato Rey hasta Plaza Las Américas y el Complejo Deportivo lo cual daría mayor flexibilidad al Proyecto bajo consideración.

Espero que estos comentarios sean de utilidad en la toma de la decisión final para el mayor éxito de este proyecto.

Cordialmente,



Juan H. Cintrón
Secretario de Comercio

AMA-83.043

Núm. 13-0683025

Sírvase mencionar este número cuando se refiero a este asunto.

Dirija toda comunicación al
PRESIDENTE Y GERENTE GENERAL

21 de junio de 1983

Dr. Rafael Farfá, Secretario
Departamento de Transportación
y Obras Públicas
Centro Gubernamental Minillas
Santurce, Puerto Rico

*Ref. al Dr. RG, P
Att: Ins. Hordace Ant*

Estimado señor Secretario:

De acuerdo a las instrucciones en su carta del 13 de mayo de 1983, con la cual nos refirió para revisión y comentarios la Declaración de Impacto Ambiental preliminar para el proyecto conocido como Agua-Guagua, a continuación le sometemos nuestras recomendaciones.

1. Recomendamos que se revise el texto de la parte narrativa del informe en las páginas 6 y 55 de la siguiente manera:

Página 6

On the other hand,
.....would have to make use of the private automobile or any available transportation services.

Página 55

Old San Juan is one of the most.....
.....parking facilities and the limitations of transportation services to Old San Juan,

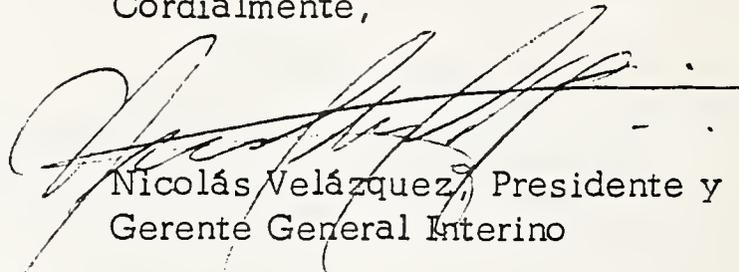
2. Alternativas para Trayectoria del Servicio de Guaguas

Favorecemos la consideración adicional de la Alternativa Núm. 2 en su concepto de lazo para conectar al Terminal Intermodal y ofrecer servicio al área .

Entendemos que esta opción requeriría una inversión considerable debido a las mejoras requeridas en la Arterial B, pero recomendamos análisis operacionales adicionales con relación a la mayor efectividad del servicio a prestarse por la AMA y las posibilidades de enlace con otras rutas existentes y futuras.

Deseamos extender nuestras felicitaciones a los funcionarios de ese Departamento por la buena organización y eficiente presentación del proyecto a la ciudadanía.

Cordialmente,

A handwritten signature in black ink, appearing to read 'Nicolás Velázquez', is written over a horizontal line. The signature is fluid and cursive.

Nicolás Velázquez, Presidente y
Gerente General Interino

RR/vm

INFORME DE COMENTARIOS A LA DECLARACION DE IMPACTO AMBIENTAL PRELIMINAR
DEL PROYECTO AGUA-GUAGUA

El proyecto propuesto consiste de un sistema combinado de transpor-tación para el Nuevo Centro Urbano de San Juan que se desarrollará en el área de Hato Rey. Integra un servicio de lanchas y autobuses mediante un terminal intermodal a localizarse próximo al Canal Martín Peña y la Avenida Muñoz Rivera.

El servicio de autobuses conectará el nuevo terminal con el Centro Comercial Plaza Las Américas y las facilidades de estacionamiento del Complejo Deportivo Bithorn-Clemente a través de los desarrollos del Nuevo Centro de San Juan. De esta forma se provee buena accesibilidad en el área cubierta por los autobuses al servicio de lanchas entre Hato Rey, San Juan y Cataño.

La DIA presenta la necesidad de realizar el proyecto y el propósito de la acción propuesta. El documento considera varias alternativas incluyendo la de no hacer nada ("no build"). Esta última no es favorecida porque mantendría las condiciones actuales (congestión, escasez de estacionamiento, servicio de autobuses con frecuencias altas, etc.) que impedirían el desarrollo y crecimiento económico del Nuevo Centro de San Juan y el establecimiento de un servicio rápido y directo entre Hato Rey y San Juan.

Las alternativas de construcción se dividen en cuatro (4) áreas:

1. rutas de lanchas (waterways) - 6 alternativas
2. lanchas
3. terminales - 3 alternativas de localización
4. rutas de autobuses - 4 alternativas

En cada área se presentan varias alternativas incluyendo costos e impactos socio-económicos y ambientales. Nuestros comentarios se dirigen principalmente al área concerniente a transportación por autobuses. En este sentido la DIA presenta cuatro alternativas para la ruta de autobuses (busways) en el servicio entre el terminal intermodal y el Complejo Deportivo atravesando el Nuevo Centro de San Juan.

Los comentarios específicos recibidos del personal que le fue circulado la DIA se resumen de la siguiente forma:

1. Todas las alternativas consideradas (4) presentan altos costos de implementación debido a los altos costos de construcción y adquisición de terrenos.
2. La alternativa de ruta a seleccionarse deberá ser aquella que mejor permita su utilización para modificar las rutas existentes de la A.M.A. para conectar el nuevo terminal con otros sectores principales de actividad en el Area Metropolitana de San Juan.
3. Un criterio adicional que la selección de la ruta debe considerar es la cantidad de facilidades exclusivas para autobuses (Carril Exclusivo) que ofrece la alternativa.
4. La evaluación de las alternativas de rutas presentadas en la tabla número 10 (Busways Alternatives Rating) parece basarse en el diseño y desarrollo completo del Nuevo Centro.

En el área de terminales tenemos los siguientes comentarios:

1. La discusión de este tema es muy limitada.
2. La alternativa de localización del terminal intermodal recomendable a los objetivos de la A.M.A. debe ser la que permita modificar las rutas existentes y futuras para su utilización.

3. El terminal intermodal debe ajustarse a las condiciones operacionales de la A.M.A.

La lectura del documento produce varias preguntas que entendemos deben considerarse. Entre estas se encuentran las siguientes: !Qué tipo de autobus se visualiza para la ruta de autobuses? Las unidades a utilizarse se incluyen en el proyecto o serían provistas por la A.M.A.

Resumiendo entendemos que el proyecto Agua-Guagua tiene un impacto significativo para la Autoridad Metropolitana de Autobuses y en específico para los objetivos de transportación que este proyecto persigue.

AUTORIDAD DE ENERGIA ELECTRICA DE PUERTO RICO

SAN JUAN, PUERTO RICO

DIRECCION CABLEGRAFICA
PREPA
DIRECCION TELEX AC
385714



APARTADO 4267
CORREO GENERAL
SAN JUAN, PUERTO RICO 00936

29 de junio de 1983

HT
1254
Hon. Rafael Faría
Secretario, Departamento de
Transportación y Obras Públicas
Apartado 41269 Estación Minillas
Santurce, Puerto Rico 00940

Recibido por _____
Fecha _____
Dato _____

Asunto: DIA Preliminar y Vistas Públicas
Proyecto Agua-Guagua
Núm. 0508/MAB/NQC/nie

Estimado señor Secretario:

La Autoridad de Energía Eléctrica ha evaluado la Declaración de Impacto Ambiental Preliminar de referencia. Luego de realizar los estudios de campo correspondientes, la Autoridad tiene los siguientes comentarios:

1. Este proyecto afecta nuestra Línea de Transmisión Hato Rey-Sabana Llana. Esta tiene una altura actual de 11 pies sobre la superficie del agua y sería necesario levantarla para que no interfiera con el paso de lanchas.
2. Se incluyen los planos donde fueron marcadas las facilidades de distribución soterradas y aéreas que puedan afectarse por el proyecto. Para los trabajos de relocalización de líneas o cualquier otro tipo de facilidades deberá coordinarse con el Ing. Gilberto Cruz Delgado, Ingeniero de Area de San Juan, en el Centro de Transmisión de Monacillos, antes de dar comienzo a la construcción.

Esperamos que estos señalamientos sirvan para lograr una coordinación efectiva para el desarrollo de este proyecto.

Cordialmente,

José Marina, Director
de Planificación e Ingeniería

GOVERNMENT OF PUERTO RICO
Solid Waste Management Authority

OFFICE
EXECUTIVE DIRECTOR

83 JUN 13 PM 3:56

9 de junio de 1983

SECRETARÍA DEL SECRETARIO

Dr. Rafael Faría
Secretario
Departamento de Transportación y Obras Públicas
Apartado 41269, Minillas Station
Santurce, P.R. 00940

ASUNTO: COMENTARIOS D.I.A. PRELIMINAR PROYECTO AGUA-GUAGUA
Núm. 0508 / MAB / NQC / nie

Estimado Dr. Faría:

Nuestros comentarios, respecto al asunto de epígrafe, los hacemos tomando como base nuestro propósito básico, que es buscar y promover soluciones adecuadas y viables a los problemas relacionados con la disposición final de los desperdicios sólidos en Puerto Rico.

Nuestros comentarios específicos al respecto son los siguientes:

1. En este documento se presentan dos alternativas (pags. 83-85) para bregar con la disposición final del material drenado que se genere mediante el proceso de canalización del canal Martín Peña. Estas alternativas son:
 - a. Depositarlos tierra adentro, y
 - b. Depositarlos en el Océano.

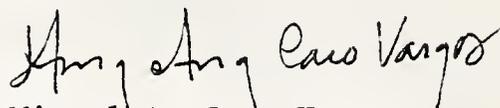
Esta Autoridad favorece que se opte por la alternativa "b", ya que según el análisis que se presenta en la D.I.A., ésta parece ser la mejor y la que no tendrá efectos adversos significativos. Por el contrario, en lo que respecta a la alternativa de depositar el material drenado tierra adentro, ninguna de las opciones puede ser recomendada favorablemente.

2. En lo concerniente al proyecto per-sé, nos parece que el sistema de transportación acuático-terrestre que se propone, es un paso muy adecuado y correcto para mejorar la transportación de masas hacia el Centro del Area Metropolitana.
3. A manera de hipótesis, nos parece que el drenaje del caño Martín podría, eventualmente, presentar la posibilidad de que se dé consideración a la idea de utilizar las vías acuáticas para transportar los desperdicios sólidos a la proyectada planta de conversión termal de San Juan o a otros sistemas de disposición final de desperdicios sólidos que puedan ser construidos en el futuro, para servir a diferentes áreas del Area Metropolitana.

Dr. Rafael Faría
9 de junio de 1983
página 2

Muchas gracias por la atención que tenga usted a bien prestar a estos comentarios.

Cordialmente,



Miguel A. Caro Vargas
Director Ejecutivo

mzc

cc

CORPORACION DEL NUEVO CENTRO DE SAN JUAN
APARTADO GPO BOX 32, SAN JUAN, PUERTO RICO 00936 TEL. (809) 754-9350



20 de junio de 1983

Hon. Rafael Faría, Secretario
Departamento de Transportación
y Obras Públicas
Apartado 41269
Minillas Station
Santurce, PR 00940

ASUNTO: DIA PRELIMINAR
PROYECTO "AGUA-GUAGUA"
Num. 0508/MAB/NQC/NIE

Honorable Doctor Faría:

La Corporación del Nuevo Centro de San Juan fue creada en virtud de la Ley Número 81, del 23 de junio de 1971, según enmendada, para planificar, desarrollar y administrar un sector de Hato Rey comprendido entre el Caño de Martín Peña, Avenida Ponce de León, Avenida César González y el Norte de la Avenida Roosevelt.

El Nuevo Centro de San Juan una vez desarrollado, será el centro urbano principal del área metropolitana. El Nuevo Centro se convertirá en el mayor generador de tránsito. Habrá de 7 a 10 millones de piés cuadrados de espacio de oficinas; de 2 a 3 millones de piés cuadrados de área comercial e institucional y de 4,000 a 5,000 unidades de vivienda. Esta concentración de actividades generará unos 300,000 a 400,000 viajes.

Esto significa que el desarrollo contemplado dentro del Nuevo Centro de San Juan depende y dependerá grandemente de las nuevas facilidades de transportación capaz de mover eficientemente grandes números de personas.

Por lo tanto, reconociendo la importancia que tiene la transportación pública para el Nuevo Centro de San Juan, esta Corporación endosa totalmente el propuesto sistema de transportación conocido como "Agua-Guagua".

RECIBIDO
SECRETARÍO
20 JUN 24 PM 1:34

En cuanto a las alternativas presentadas, endosamos la alternativa dos (2) de la ruta de guaguas y la alternativa tres (3) del terminal en el Nuevo Centro, al oeste del Canal.

Cordialmente,

A handwritten signature in black ink, appearing to be 'Juan Olazagasti', written over a horizontal line. The signature is somewhat stylized and includes a large loop at the end.

Juan Olazagasti, Director
Operaciones - CNCSJ

JO/ddp



INSTITUTO DE CULTURA PUERTORRIQUEÑA

03 JUN 5 PM 3:32

ARQ. HECTOR DARIO PEREZ
DIRECTOR

DIVISION DE
PRESERVACION HISTORICA

SECRETARIO

June 9, 1983

Mr. Charles H. Graves
Director
Office of Planning Assistance
Urban Mass Transportation Adm.
400 7th Street, S.W.
Washington D.C. 20590

Dear Sir:

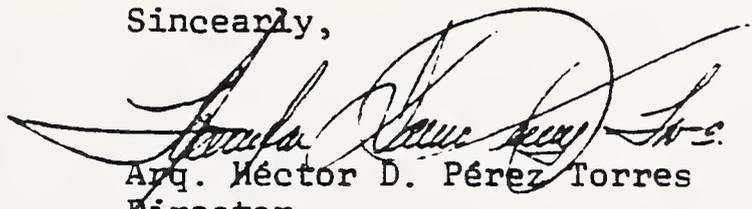
Our Division have revised the San Juan Urban Core Transportation System (Agua-Guagua) Draft Environmental Impact Statement.

The Archeology Section has knowledge of your coordination with the State Historic Preservation Officer.

The Institute of Puertorrican Culture has the responsibility to enforce the preservation of our cultural resources, inland and off shore in the Commonwealth of Puerto Rico.

Since there are no historical or prehistorical significant occupations in the area; there will not be any inconvenience regarding the project, pre-colombian or historic occupation shall occur, please stop operations at once and contact the State Historic Preservation Officer.

Sincerely,



Arq. Héctor D. Pérez Torres
Director
Historic Preservation

HDP-mq

ESTADO LIBRE ASOCIADO DE PUERTO RICO

Compañía de Turismo

DIRECTOR EJECUTIVO

33 JUL 6 AM 11:31

7 de julio de 1983
SECRETARIO

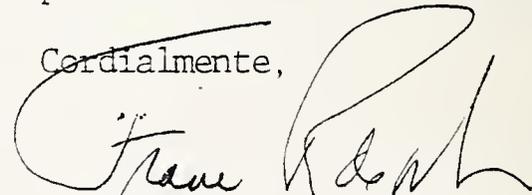
Hon. Rafael Faría González
Secretario
Departamento de Transportación
y Obras Públicas
Apartado 41269
Estación Minillas
Santurce, Puerto Rico 00940

Estimado Doctbr Faría:

Le agradezco su reciente comunicación relacionada con la Declaración de Impacto Ambiental (DIA) Preliminar para el proyecto conocido como Agua-Guagua.

Entendemos que el sistema de transportación propuesto, utilizando las aguas del Caño Marín Peña y los terminales existentes del Viejo San Juan y Cataño, aliviarán la congestión vehicular motorizada de las principales vías de la ciudad así como la situación existente de escasez de estacionamiento. En adición, este proyecto ofrecerá a nuestros ciudadanos y visitantes otra alternativa para sus actividades recreativas en el Area Metropolitana.

Cordialmente,



Frances Ríos de Morán



ESTADO LIBRE ASOCIADO DE PUERTO RICO
COMPAÑIA DE FOMENTO INDUSTRIAL DE PUERTO RICO
APARTADO 2350 SAN JUAN, PUERTO RICO 00936

José M. Cobian

Presidente y Gerente General

TEL. 764-1175

Ref: P-2656

13 de junio de 1983

Sr. Rafael Faría
Secretario
Departamento de Transportación
y Obras Públicas
Apartado 41269
Estación Minillas
Santurce, Puerto Rico 00940

Atención: Ing. Néstor Quevedo
División Estudios Ambientales

Estimado señor Faría:

Asunto: DIA-P
Proyecto Agua - Guagua
Núm. 0508/MAB/NQC/nie

Nos referimos a su correspondencia del 13 de mayo, con la que incluye la Declaración de Impacto Ambiental preliminar (DIA) sobre el proyecto que se indica en el asunto.

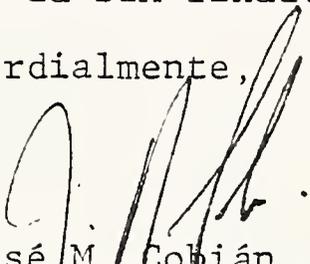
Hemos observado que en ese documento se cubren los aspectos más importantes para una DIA. Consideramos que la alternativa núm. 1 para la ruta de guaguas es la más viable y más conveniente. Servirá al área industrial Tres Monjitas adecuadamente.

Este proyecto será de gran importancia para el movimiento de pasajeros desde Hato Rey hacia San Juan y Cataño y viceversa. En especial beneficiará a la fuerza trabajadora de Tres Monjitas y demás centros de trabajo existentes. Será una alternativa muy importante para las personas menos privilegiadas y su uso producirá descongestión del tránsito, especialmente en las horas más críticas. Esperamos que este proyecto se desarrolle lo más pronto posible.

Sr. Rafael Faría
13 de junio de 1983
Página 2

Confiamos que estos comentarios ayuden en la preparación
de la DIA final.

Cordialmente,



José M. Cobián
Presidente y Gerente General

Anexo

A-65.19

OFICINA DE PLANIFICACION Y PRESUPUESTO

9 de junio de 1983

23 JUN 20 AM 10:23

SECRETARIO

Dr. Rafael Faría González
Secretario
Departamento de Transportación y
Obras Públicas
Apartado 41269
Minillas Station
Santurce, PR 00940

RE: DIA PRELIMINAR PROYECTO
AGUA-GUAGUA

Estimado doctor Faría:

Hemos recibido copia de la Declaración de Impacto Ambiental de (DIA) Preliminar para el proyecto de transportación Agua-Guagua.

Consideramos que el documento cubre de forma satisfactoria todos los factores a considerarse para determinar los impactos del proyecto.

Aprovecho para informarle que esta Oficina habrá de enviar un representante a las vistas públicas a celebrarse.

Cordialmente,



Carlos T. Novoa
Director Ejecutivo

pu/mco



MUNICIPIO DE SAN JUAN

CALLE SAN JOSE 151 - 153 - 155 APARTADO 4355, SAN JUAN, PUERTO RICO 00905 • TEL. (809) 724-7171

Asociación de Comerciantes del Viejo San Juan

Edificio González Padin - Oficina 617 • P.O. Box 1110 • San Juan, Puerto Rico 00902 • Tel: 725-5042

PONENCIA DE LA ASOCIACION DE COMERCIANTES DEL VIEJO
SAN JUAN SOBRE EL PROPUESTO PROYECTO AGUA-GUAGUA.
20 de junio de 1983.

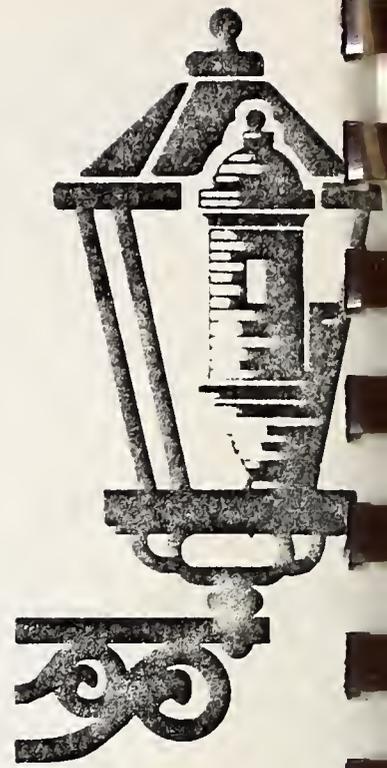
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Mi nombre es Carlos González Miranda y comparezco en estas vistas públicas que celebra el Departamento de Transportación y Obras Públicas sobre el propuesto proyecto conocido como Agua-Guagua en representación de la Asociación de Comerciantes del Viejo San Juan, institución de la cual soy Vicepresidente.

El Departamento de Transportación y Obras Públicas de Puerto Rico ha informado al país que el proyecto Agua-Guagua consiste de un sistema combinado de transportación acuática y terrestre. Se propone extender el servicio actual de lanchas entre Cataño y el Viejo San Juan para dar servicio al Nuevo Centro de Hato Rey a través del Caño Martín Peña y el Canal Ochoa. Para ello será necesario dragar el Caño Martín Peña. En el área del Nuevo Centro de Hato Rey se construirá un terminal intermodal que dará servicio a los pasajeros de lanchas y guaguas. Se proveerá una nueva ruta de guaguas que conectará el terminal, Plaza Las Américas y el Coliseo Roberto Clement a través del nuevo Centro de Hato Rey.

En estas vistas públicas se discutirán las diferentes alternativas bajo estudio y sus efectos socio-económicos y ambientales, según documentado en la Declaración de Impacto Ambiental Preliminar preparada para el proyecto, de acuerdo a la invitación que para participar en estas vistas públicas cursó el Secretario del Departamento de Transportación y Obras Públicas, doctor Rafael Faría.

La Asociación de Comerciantes del Viejo San Juan respalda el concepto básico de este proyecto Agua-Guagua que consiste en proveer transportación colectiva marítima Este-Oeste complementada con transportación colectiva terrestre Norte-Sur. Este respaldo está condicionado a que el Viejo San Juan — lo más valioso de Puerto Rico después de su gente



a que no se afecte el actual servicio de transportación marítima colectiva mediante lanchas que comunican al Viejo San Juan con Cataño y la zona suroeste del área metropolitana.

El respaldo de la Asociación de Comerciantes del Viejo San Juan también está condicionado a que las rutas de transportación terrestre mediante guaguas a ser creadas o ampliadas sean dirigidas al corredor Norte-Sur, o sea Santurce-Río Piedras, utilizando así los recursos del erario público para promover la revitalización y estabilización de zonas necesitadas tales como Santurce y Río Piedras. Tales recursos públicos no deben ser dirigidos a favorecer aún más a zonas ya servidas adecuadamente por rutas de guaguas y que actualmente gozan de grandes ventajas como Plaza Las Américas, según se propone en el proyecto Agua-Guagua anunciado para estas vistas públicas.

El corredor Norte-Sur Santurce-Río Piedras, con sus grandes núcleos poblacionales, fortalecido mediante un mejor sistema de guaguas significará gran parte del éxito que pueda tener este proyecto Agua-Guagua.

Favorecemos esta primera fase del proyecto por cuanto incluye el tramo acuático Viejo San Juan-Nuevo Centro de Hato Rey que proveerá una vía de comunicación adicional que es importante y necesaria para la mejor integración del área metropolitana y en especial del Viejo San Juan con las otras áreas de la ciudad.

Recomendamos se considere la implementación del tramo acuático entre el intermodal del Nuevo Centro de Hato Rey y la Laguna San José para completar el sistema Este-Oeste en una forma verdaderamente importante para el área metropolitana. Esto proveerá un segundo acceso desde el Aeropuerto Internacional de Isla Verde hasta el Viejo San Juan, que actualmente sólo se comunican por medio del Expreso Baldorioty de Castro.

Reconocemos que la necesaria limpieza del Caño Martín Peña como parte de este proyecto será de gran beneficio desde el punto de vista conservacionista y ambiental.

Este proyecto aprovecha un importante recurso natural hasta ahora no utilizado para integrar y mejorar los sistemas de accesos y comunicación sin requerir la costosa construcción de carreteras a varios niveles que fragmentan o subdividen la ciudad en perjuicio del libre movimiento de la ciudadanía.

Exhortamos al Departamento de Transportación y Obras Públicas de Puerto Rico a explorar otras vías de comunicación para mejor integrar al Viejo San Juan con el resto del área metropolitana. Muchas gracias.

July 5, 1983

Mr. Néstor Quevedo, P.E.
Chief, Environmental Studies Division
Puerto Rico Department of Transportation
and Public Works
P. O. Box 41269
Minillas Station
Santurce, Puerto Rico 00940

RE: San Juan Urban Core Transportation System
(Agua-Guagua); Draft Environmental Impact
Statement ("EIS")

Dear Mr. Quevedo:

I am an ex-member of the Board of Directors of Energía Verde, Inc., a nonprofit organization involved in the promotion of alternate energy sources in Puerto Rico. One of this group's main concerns since its inception has been the lack of respect and consideration towards bicycle users and pedestrians in most transportation projects in Puerto Rico.

As to the above referenced matter I wish to comment on the following:

a) The draft EIS does not contain any provisions whatsoever for pedestrian and bicycle safety and use as an integral feature of the project. In accordance with DOT Order 5610.1C, Attachment 2 (revised December 29, 1980), Chapter II, Section 5, the likely effect on bicycling has to be considered for any proposed actions which include highway projects, bridge permits, air terminal facilities, and transit terminals or malls.

b) The draft EIS does not contain an assessment of the impact resulting from construction and operation of the proposed action on bicycling and walking, as well as measures to mitigate those impacts and provide for these users. See Section 5(a)(2) of DOT Order 5610.1C, supra.

c) The DOT of Puerto Rico must consider certain bike-way projects which have been previously proposed and shelved by the Municipality of San Juan which intend to use the Martín Peña channel upper shores as part of an integrated bikeway system connecting San Juan, Santurce, Barrio Obrero, Cantera, Hato Rey and Río Piedras. This system is geared towards promoting safe

Mr. Néstor Quevedo

July 5, 1983

Page Number 2

biking for all ages and all occupations. Although the system has been shelved by the City of San Juan, it is an important concept which should not be overlooked by any serious planning board or construction overseers of the greater San Juan area.

In view of the above the needs of bicyclists are not adequately considered by the Draft EIS referred to above and therefore, your agency must revise the plans for the project to take these needs and DOT provisions into account. The use of bicycles and other nonmotorized transportation vehicles must be a top priority to all local and federal government planners when considering any transportation projects, particularly when Puerto Rico's congested traffic conditions and overpopulation call for alternatives such as these.

Truly yours,

A handwritten signature in dark ink, appearing to read "Frank D. Inserni", with a long horizontal flourish extending to the right.

Frank D. Inserni

cc: Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration

Hernán Padilla, Mayor
City of San Juan

Ralph Hirsch
League of American Wheelmen

P.S. - My address is Banco Popular Center, Suite 832, Hato Rey,
Puerto Rico, 00919.



United States
Department of
Agriculture

SUPPLEMENTAL ENVIRONMENTAL STATEMENT
FOR THE
Forest Service
U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C. 20250

Reply to: 1950

Date: July 1, 1983

Mr. Charles H. Graves, Director
Office of Planning Assistance
Urban Mass Transportation Administration
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Graves:

I was asked by the Puerto Rico Department of Transportation to comment on the Draft Environmental Statement (DEIS) on San Juan Urban Core Transportation System (Agua-Guagua). In the Enclosure I provide comments on specific pages of the document with emphasis on areas that require clarification or correction. Here I present my comments on the environmental impacts of the various project alternatives with suggestions for the selection of the least environmentally damaging alternative.

It is obvious that this project is environmentally sensitive. Depending upon the alternative chosen, up to 40 acres of mangroves could be lost, loss of other types of wetlands are also possible but not discussed in any detail, two federally endanger bird species live and feed in the project area as do numerous migratory and local bird species, the San Juan Bay will be affected by the project, as will one of the few remaining green areas in the San Juan Metropolitan Area. All these environmental problems are explained in the DEIS, but the discussion lacks depth in the analysis of alternatives. The enclosure discusses some of the areas where the DEIS must improve. Mangroves in the Metropolitan Area require special attention because there are a number of projects in a variety of stages of development that impact mangroves. Examples of threatened mangroves are those in the San José Lagoon, those in the way of the channelization of the Río Piedras and the Agua-Guagua. If projects in other sectors of the north coast are added one could show that not since the early seventies have mangroves in Puerto Rico been subjected to such impacts of development. Most of these projects are conducted with federal funds or federal endorsement in spite of the fact that federal policy is to protect wetlands. While it is true that today mitigation efforts are keen, the fundamental problem of mangrove conservation deserves closer attention by all agencies concerned.

Agua-Guagua should be pursued with the least impact on mangroves and mud flats. Interestingly, unlike other projects, in this one the least area of mangroves that are impacted, the least cost to the federal government. Thus, the usual argument that environmental protection is too expensive does not apply in Agua-Guagua. It will be possible to select the least damage to the mangroves and mud flats as the preferred alternative.



My suggestions for making the project environmentally sound are:

1. Experiment with the construction of mud flats before destroying existing mud flats.
2. Reduce the width of the channel to 80 feet in order to minimize damage to wetlands.
3. Use submerged bulkheads on the sides of the channel.
4. Implement all suggested restrictions on dredging in order to minimize impacts on water quality and on San Juan Bay.

Arguments in favor of these recommendations are:

1. Mud flats in the project area are too valuable to just destroy and assume that the new ones will be as sound as the existing ones. It is unnecessary to elaborate here on the immense value of these mud flats for wildlife.
2. The vessels that are being purchased will be able to navigate through the 80 foot wide channel under the three bridges along the way. In fact, they will do so with a 25 foot clearance on each side. By reducing channel width, impact on wetlands is less and cost is reduced, while still accomplishing the goals of the project. No justification for wider channels are given in the DEIS other than the obvious desire to have as broad a channel as possible for two way traffic. The DEIS even mentions recreative use of the channel. I believe that the environmental values of the region (wetlands, water and wildlife) dictate more prudence in the design and use plans. The more traffic in the channel, the higher the potential impact against water, wildlife and wetlands. More analysis on these aspects of the study is needed.
3. Submerged bulkheads will allow water exchange with wetlands. This keeps them alive. Any alternative that affects water exchange with wetlands is unacceptable.
4. The channelization of the Caño Martín Peña could create serious water quality problems downstream particularly in the San Juan Bay. Any precaution to minimize these impacts are well justified. The DEIS does not contain a single analysis of sediment chemistry. These are needed to anticipate any problems with pollutants.

In summary, the DEIS for Agua-Guagua dangerously underestimates the impacts of the project. However, unlike other similar projects, environmental restrictions decrease rather than increase project costs. I propose that the project

Page 3
July 1, 1983

be designed to allow the navigation of one ferry at a time and that further use of the waterway be studied carefully. The unique values of the last green wetland area in Metropolitan San Juan can be conserved while accomplishing the goal of providing better service to the people of Puerto Rico.

Sincerely,



ARIEL E. LUGO
Project Leader
USDA-Forest Service

Enclosure

xc: Hon. Hilda Díaz Soltero, DNP-PR
Gilberto Cintrón, DNR-PR
Pedro Gelabert, EQB-PR
Ferdinand Quiñones, Geol. Survey-PR
John Blankenship, USFWS-PR
Weems Clevenger, EPA-PR
Peter W. Anderson, Marine & Wetlands Prot., EPA, NY
John A. Tiedemann, Marine & Wetlands Prot., EPA, NY
Miguel Rivera Ríos, Head of Planning Board

DETAIL COMMENTS ON DEIS

This project is justified on the basis that it will provide better transportation service to the San Juan Metropolitan Area, foment development of vacant lands in Hato Rey, and help two state government agencies with their deficits. It is obvious that better transportation service to the San Juan Metropolitan area will be a product of this project. Increased development of the Hato Rey area, however, could have negative social impacts if it is done at the cost of older areas in San Juan (which will deteriorate as a result) or if the expected development adds to the congestion and other related problems of San Juan. As a result, bus traffic could again slow down to pre-project speeds. This justification requires careful thought and analysis. The deficits in the two state government agencies responsible for buses and ferries are probably unrelated to ridership and should not be used as a justification for this project unless the claim can be shown with data.

On page 2, planned future developments along the canal and rights of way of the proposed terminal for rapid traffic construction are mentioned, but not discussed because they are not part of this proposed action. On page 26, future terminals are mentioned. Peace meal planning usually creates problems in the future, when critical elements of existing facilities are unveiled. If such critical elements are environmentally sensitive, undue pressure and inconvenience is generated. To avoid this, all proposed developments along the canal, which are bound to be very harmful to the mangrove and other wetlands in the area, must be discussed as part of this proposal.

On pages 41, 44, and 45, the drafters of the EIS discuss the role of algae in terms of environmental quality. All these discussions are factually wrong in the sense that they picture algae and other aquatic life as causers

of pollution and even indicate that plant photosynthesis causes pollution because it changes the pH and alkalinity of the water. Correcting these mistaken views in this commentary would be analogous of teaching the ABC and so I simply suggest a thorough reading of elementary estuarine or marine ecology textbooks. Organisms do not cause pollution, they cope with conditions created by humans. Photosynthesis is not intense enough to significantly change the pH or alkalinity of estuarine waters.

If the mud flats are declared a natural reserve in the Coastal Zone Management Plan (p 46) while this DEIS indicates that two mud flats will be eliminated (p 77), how can the DEIS be consistent with the Coastal Zone Management Plan? On page 87, seven reasons are given to support the consistency between this project and the Coastal Zone Management Plan. All seven are questionable or irrelevant (3,4), and four are unsupported assertions (1, 2, 5, and 6).

On page 55, a paragraph is dedicated to community cohesion. Nothing is said of community dislocation in terms of all the displaced families and businesses that will result from the project. It appears that these sections of DEIS are included simply to satisfy a format requirement rather than to satisfy a requirement of substance. For example, how will the project improve on water quality (p 56)? If anything, water quality will deteriorate with the presence of vessels, etc. This pollution is normal and to be expected. To be useful as a planning tool, the DEIS must spell out all consequences of the project.

Another example of the superficial treatment of important impacts is wetlands and wildlife. How will the project have long-term beneficial impacts on wetlands that are now doing fine without the project (p 75)?

Other areas that require more analysis:

- ° On related Projects (p 78). The analysis should project the acreage of wetlands to be lost if all projects are approved. A more thorough listing of projects is needed.
- ° Not much analysis is given to the loss of wetlands other than mangroves.
- ° No chemical analysis of muds along the channel are given.



Estado Libre Asociado de Puerto Rico

Departamento de la Vivienda

AVENIDA BARBOSA 606 - APARTADO W - RIO PIEDRAS, PUERTO RICO 00929

5 de julio de 1983

Sr. Rafael Faría, Secretario
Departamento Transportación
y Obras Públicas - Edificio Sur
Centro Gubernamental Minillas
Santurce, Puerto Rico

RE: Caso 0508/MAB/NOB/mie
DIA Preliminar
Proyecto Agua-Guagua

Estimado señor Faría:

Recientemente recibimos en este Departamento la DIA Preliminar del proyecto de epígrafe. La misma fue analizada y evaluada desde el punto de vista de la relación que dicho proyecto pueda tener con proyectos de vivienda auspiciados por este Departamento.

El proyecto en general será de mucha utilidad para las familias y/o personas que por su lugar de trabajo o estudios hagan uso del mismo, pero para su realización bajo cualquiera de las alternativas presentadas se requerirá el realojo de las familias de la Barriada Tokio. Esta barriada está compuesta por unas 150 familias.

La página número 26 de la DIA, el Tópico C, referente a los terminales de la ruta y párrafo número 4, indica que estas familias al presente están siendo realojadas como parte del desarrollo del Nuevo Centro de San Juan y el desarrollo del Canal Martín Peña. Por otro lado la página número 50 indica que la barriada ha de ser relocalizada como parte del plan para el desarrollo del propuesto proyecto Agua-Guagua.

Como quiera que sea si están realojando a las familias o si han de ser realojadas como parte del plan no hemos hasta estos momentos recibido el estudio socio-económico y el plan de realojo de las familias.

El primero de estos documentos se prepara con el propósito de conocer los niveles socio-económicos de las familias, su preferencia por vivienda y lugar a donde ser realojadas. El segundo documento forma parte de la planificación del movimiento de esa población a otros lugares. Cuando a un proyecto se le asignan fondos federales y el mismo requiere realojo de familias la preparación de esos documentos es mandatoria.

Sr. Rafael Faría
Secretario
Departamento Traspotación
y Obras Públicas

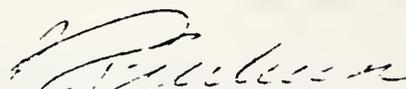
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5 de julio de 1983

Espero que estos comentarios sirvan a su propósito.

Aprovecho la oportunidad para reiterarnos a sus órdenes para la búsqueda de soluciones a problemas que incidan en el área de la vivienda.

Cordialmente,


Jorge A. Pierluisi
Secretario

230 -JUL 1983

Mr. Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 7th Street, S.W.
Washington, D.C. 20590

Rating Class: see text

Dear Mr. Graves:

We have completed our review of the draft environmental impact statement (EIS) for the San Juan Urban Core Transportation System (Agua Guagua). Our comments on this project had originally been due on July 5, 1983, but your office graciously extended the deadline by 15 days when our regional office failed to receive the draft EIS's when they were first distributed. We thank you for this consideration.

The major concern which arose during our review involves the waterway aspect of this multimodal transportation system. There are six alternatives besides no-action associated with the dredging of the Martin Pena and Ochoa Canals. Table 21 on page 78 indicates construction costs associated with these various dredging alternatives, along with the associated mangrove destruction that will take place. Implementation of alternatives 3,4, or 6 will result in the loss of large acreages of mangroves in an area which now constitutes the last large wetlands area in metropolitan San Juan. Mitigation for such a loss was not specifically addressed in the draft EIS, except for a possible location for a mud flat creation project. We are unconvinced that large scale mitigation such as this could be successful, and we would prefer to see another alternative be designated as part of the selected plan.

Alternatives 2,3,5 and 6 involve the use of bulkheads or a combination of bulkheads and revetted dikes for control of erosion caused by boat wakes. We don't believe that such devices are necessary for protecting mangroves and mudflats, which are habitats that are highly resistant to erosion. The installation of such devices could also have the undesirable impact of reducing the existing sheet flow through the mangroves and mudflats, thus reducing the purifying effect that this flow achieves. Increased water quality degradation in the canals could result.

We believe that alternative 1 provides the most environmentally acceptable alternative for the waterway aspect of the project. However, we are concerned that mitigation efforts have been proposed only for alternatives 3,4, and 6. We believe that mitigation for the loss of 6.5 acres associated with alternative 1 is environmentally justifiable, and we would recommend that mitigation for this alternative, should it be selected, be provided in the final EIS.

The disposal of the material to be dredged from the canals will either be disposed of at an upland site or ocean dumped. However, the draft EIS does not provide an analysis of the sediment to be dredged. Also, we believe that for the ocean dumping alternative the size of the area that was predicted for receiving the dredged material may be underestimated. The final EIS should demonstrate via calculations the accuracy of the 5000 square foot area given in the draft EIS. We cannot comment on the dredge disposal alternatives until such data is made available, preferably prior to publication of the final EIS. Incidentally, on page IV, issuance of section 103 ocean dumping permits is mistakenly attributed to EPA. The Corps of Engineers issues these permits, while EPA provides an independent analysis of the dredged material's compliance with its marine Environmental Impact Criteria, issued pursuant to the Marine Protection, Research, and Sanctuaries Act.

We are aware of at least two other major projects in the San Juan area which will be destroying mangrove habitat and which are looking into suitable areas for mangrove mitigation: The Baldorioty De Castro highway improvement project and the Rio Piedras flood control project. The San Jose Lagoon mangroves are being threatened by piecemeal development. The cumulative effect on the San Juan area mangrove system needs to be discussed. More importantly, there are not very many areas suitable for mangrove mitigation in the San Juan area. Thus there may be significant inter-project competition for these same sites. We recommend that an analysis of the above considerations be included in the final EIS.

A potential for secondary wetland impacts also appears to exist. The new and improved waterfront ferry terminal may generate adjacent retail and service businesses which might require wetlands filling for site preparation. Also, the improved Martin Pena Channel might encourage other port interests to now locate their facilities along the canal. This could generate additional dredging and filling of aquatic sites. Secondary impacts such as these should also be analysed in the final EIS.

Our review of the air quality analysis associated with the various bus routing alternatives has indicated that no contraventions of the carbon monoxide standard will occur, and therefore we lack objections to any of these alternatives.

We have no comment on the boat design criteria or the location of the multimodal terminal, since there are no significant environmental issues associated with these aspects of the project.

Therefore, in accordance with EPA policy, we have rated the no-action alternative for the canal dredging, the alternative bus routings, and the alternative sites for the multimodal terminal as LO-1, indicating that we lack objections (LO) to these alternatives, and that we have sufficient information (1) with which to assess their environmental impacts. We have rated dredging alternatives 2 thru 6 as ER-1, indicating that we have environmental reservations (ER) concerning the significant wetlands and mudflat destruction which would occur, as well as possible water quality degradation resulting from the construction of dikes

and bulkheads. We have rated dredging alternative 1 as ER-2, because we need more information (2) on an acceptable mitigation proposal to dispel our environmental reservations. We have tentatively rated the dredge disposal alternatives as LO-2, indicating that more information on the composition of dredged material is needed, preferably prior to publication of the final EIS.

For further coordination, please contact Mr. Edward G. Als of my staff at (212) 264-1840.

Thank you very much for this opportunity to comment on the San Juan Urban Core Transportation System (Agua Guagua).

Sincerely yours,

Anne Norton Miller, Chief
Environmental Impacts Branch



Departamento de la Vivienda

AVENIDA BARBOSA 606 - APARTADO W - RIO PIEDRAS, PUERTO RICO 00923

5 de julio de 1983

Sr. Rafael Faría, Secretario
Departamento Transportación
y Obras Públicas - Edificio Sur
Centro Gubernamental Minillas
Santurce, Puerto Rico

RE: Caso 0508/MAB/NOB/mie
DIA Preliminar
Proyecto Agua-Guagua

Estimado señor Faría:

Recientemente recibimos en este Departamento la DIA Preliminar del proyecto de epígrafe. La misma fue analizada y evaluada desde el punto de vista de la relación que dicho proyecto pueda tener con proyectos de vivienda auspiciados por este Departamento.

El proyecto en general será de mucha utilidad para las familias y/o personas que por su lugar de trabajo o estudios hagan uso del mismo, pero para su realización bajo cualquiera de las alternativas presentadas se requerirá el realojo de las familias de la Barriada Tokio. Esta barriada está compuesta por unas 150 familias.

La página número 26 de la DIA, el Tópico C, referente a los terminales de la ruta y párrafo número 4, indica que estas familias al presente están siendo realojadas como parte del desarrollo del Nuevo Centro de San Juan y el desarrollo del Canal Martín Peña. Por otro lado la página número 50 indica que la barriada de ser realocalizada como parte del plan para el desarrollo del propuesto proyecto Agua-Guagua.

Como quiera que sea si están realojando a las familias o si han de ser realojadas como parte del plan no hemos hasta estos momentos recibido el estudio socio-económico y el plan de realojo de las familias.

El primero de estos documentos se prepara con el propósito de conocer los niveles socio-económicos de las familias, su preferencia por vivienda y lugar donde ser realojadas. El segundo documento forma parte de la planificación del movimiento de esa población a otros lugares. Cuando a un proyecto se le asignan fondos federales y el mismo requiere realojo de familias la preparación de esos documentos es mandatoria.

Sr. Rafael Faría
Secretario
Departamento Traspportación
y Obras Públicas

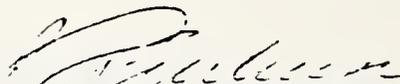
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5 de julio de 1983

Espero que estos comentarios sirvan a su propósito.

Aprovecho la oportunidad para reiterarnos a sus órdenes para la búsqueda de soluciones a problemas que incidan en el área de la vivienda.

Cordialmente,


Jorge A. Pierluisi
Secretario

230 -JUL 1983

Mr. Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 7th Street, S.W.
Washington, D.C. 20590

Rating Class: see text

Dear Mr. Graves:

We have completed our review of the draft environmental impact statement (EIS) for the San Juan Urban Core Transportation System (Agua Guagua). Our comments on this project had originally been due on July 5, 1983, but your office graciously extended the deadline by 15 days when our regional office failed to receive the draft EIS's when they were first distributed. We thank you for this consideration.

The major concern which arose during our review involves the waterway aspect of this multimodal transportation system. There are six alternatives besides no-action associated with the dredging of the Martin Pena and Ochoa Canals. Table 21 on page 78 indicates construction costs associated with these various dredging alternatives, along with the associated mangrove destruction that will take place. Implementation of alternatives 3,4, or 6 will result in the loss of large acreages of mangroves in an area which now constitutes the last large wetlands area in metropolitan San Juan. Mitigation for such a loss was not specifically addressed in the draft EIS, except for a possible location for a mud flat creation project. We are unconvinced that large scale mitigation such as this could be successful, and we would prefer to see another alternative be designated as part of the selected plan.

Alternatives 2,3,5 and 6 involve the use of bulkheads or a combination of bulkheads and revetted dikes for control of erosion caused by boat wakes. We don't believe that such devices are necessary for protecting mangroves and mudflats, which are habitats that are highly resistant to erosion. The installation of such devices could also have the undesirable impact of reducing the existing sheet flow through the mangroves and mudflats, thus reducing the purifying effect that this flow achieves. Increased water quality degradation in the canals could result.

We believe that alternative 1 provides the most environmentally acceptable alternative for the waterway aspect of the project. However, we are concerned that mitigation efforts have been proposed only for alternatives 3,4, and 6. We believe that mitigation for the loss of 6.5 acres associated with alternative 1 is environmentally justifiable, and we would recommend that mitigation for this alternative, should it be selected, be provided in the final EIS.

The disposal of the material to be dredged from the canals will either be disposed of at an upland site or ocean dumped. However, the draft EIS does not provide an analysis of the sediment to be dredged. Also, we believe that for the ocean dumping alternative the size of the area that was predicted for receiving the dredged material may be underestimated. The final EIS should demonstrate via calculations the accuracy of the 5000 square foot area given in the draft EIS. We cannot comment on the dredge disposal alternatives until such data is made available, preferably prior to publication of the final EIS. Incidentally, on page IV, issuance of section 103 ocean dumping permits is mistakenly attributed to EPA. The Corps of Engineers issues these permits, while EPA provides an independent analysis of the dredged material's compliance with its marine Environmental Impact Criteria, issued pursuant to the Marine Protection, Research, and Sanctuaries Act.

We are aware of at least two other major projects in the San Juan area which will be destroying mangrove habitat and which are looking into suitable areas for mangrove mitigation: The Baldorioty De Castro highway improvement project and the Rio Piedras flood control project. The San Jose Lagoon mangroves are being threatened by piecemeal development. The cumulative effect on the San Juan area mangrove system needs to be discussed. More importantly, there are not very many areas suitable for mangrove mitigation in the San Juan area. Thus there may be significant inter-project competition for these same sites. We recommend that an analysis of the above considerations be included in the final EIS.

A potential for secondary wetland impacts also appears to exist. The new and improved waterfront ferry terminal may generate adjacent retail and service businesses which might require wetlands filling for site preparation. Also, the improved Martin Pena Channel might encourage other port interests to now locate their facilities along the canal. This could generate additional dredging and filling of aquatic sites. Secondary impacts such as these should also be analysed in the final EIS.

Our review of the air quality analysis associated with the various bus routing alternatives has indicated that no contraventions of the carbon monoxide standard will occur, and therefore we lack objections to any of these alternatives.

We have no comment on the boat design criteria or the location of the multimodal terminal, since there are no significant environmental issues associated with these aspects of the project.

Therefore, in accordance with EPA policy, we have rated the no-action alternative for the canal dredging, the alternative bus routings, and the alternative sites for the multimodal terminal as LO-1, indicating that we lack objections (LO) to these alternatives, and that we have sufficient information (1) with which to assess their environmental impacts. We have rated dredging alternatives 2 thru 6 as ER-1, indicating that we have environmental reservations (ER) concerning the significant wetlands and mudflat destruction which would occur, as well as possible water quality degradation resulting from the construction of dikes

and bulkheads. We have rated dredging alternative 1 as ER-2, because we need more information (2) on an acceptable mitigation proposal to dispel our environmental reservations. We have tentatively rated the dredge disposal alternatives as LO-2, indicating that more information on the composition of dredged material is needed, preferably prior to publication of the final EIS.

For further coordination, please contact Mr. Edward G. Als of my staff at (212) 264-1840.

Thank you very much for this opportunity to comment on the San Juan Urban Core Transportation System (Agua Guagua).

Sincerely yours,

Anne Norton Miller, Chief
Environmental Impacts Branch



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333
(404) 452-4257
June 27, 1983

Mr. Charles H. Graves
Director, Office of Planning Assistance
Urban Mass Transportation Administration
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Graves:

We have reviewed the Draft Environmental Impact Statement (EIS) for San Juan Urban Core Transportation System (Agua-Guagua) in San Juan, Puerto Rico. We are responding on behalf of the Public Health Service.

We have reviewed this document for possible health effects and have only three comments to offer, since we believe the proposed alternatives have been adequately addressed.

The Final EIS should state which are the preferred alternatives for the waterway, the terminal location, and the busway, as well as, the preferred alternative for the disposal of dredged material from the waterway.

It was noted that the upland disposal alternative did not address potential vector problems from mosquito populations. Dredged spoil areas can be a source of mosquito breeding. If this alternative were selected, what mosquito control measures would be employed?

The Draft EIS indicates that there have been six hurricane intensity storms in the San Juan area in the past 70 years, that a construction minimum of 7 feet above sea level has been established for buildings subject to flood damage, and that these pluvial flood levels were estimated for a 50-year storm. The EIS further shows a 100-year storm flood level map and indicates the Hato Rey terminal would be on a Zone 2 classification, based on Regulation Thirteen of the Puerto Rico Planning Area. The meaning of this classification and its relationship to flood safety is not clear.

Thank you for the opportunity to review this EIS. We would appreciate receiving a copy of the Final EIS when it becomes available. If you have any questions about our comments, please contact Mr. Lee Tate at FTS 236-4161.

Sincerely yours,

Glenn S. Caldwell, RCD for

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

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